

THE AFRICAN GENUS *CROCOSMIA* PLANCHON

MIRIAM P. DE VOS

(*c/o Department of Botany, University of Stellenbosch, Stellenbosch 7600, R.S.A.*)

ABSTRACT

Herbarium material, and living material of some of the species, were examined for this revision of *Crocoshia* Planchon, a small genus of the Iridaceae closely related to *Tritonia* and *Chasmanthe*. The genus is endemic in Africa south of the equator and is concentrated in the Republic of South Africa where seven of its nine species occur. Illustrated descriptions of the species, their geographical distribution and synonymy, and a key to the species are provided. One species, *C. fucata*, which stands midway between *Crocoshia* and *Chasmanthe*, is now transferred to *Crocoshia*. The well-known horticultural hybrid *C. crocosmiflora*, is also described.

The relationships of *Crocoshia* with *Tritonia* and *Chasmanthe* are discussed and reasons are given why *Crocoshia* should remain separate from *Tritonia* with which it was often combined, and be accepted as a valid genus.

UITTREKSEL

DIE AFRIKA GENUS *CROCOSMIA* PLANCHON

Herbariummateriaal asook lewende materiaal van sommige spesies is vir hierdie hersiening van die genus *Crocoshia* Planchon ondersoek. 'n klein genus van die Iridaceae naverwant aan *Tritonia* en *Chasmanthe*. Die genus is endemies in Afrika suid van die ewenaar en is gekonsentreer in die Republiek van Suid-Afrika waar sewe van die nege spesies voorkom. Geïllustreerde beskrywings van die spesies, hul geografiese verspreiding en sinonimie, asook 'n sleutel om die spesies uit te ken, word verskaf. Een spesies, *C. fucata*, wat tussen *Crocoshia* en *Chasmanthe* staan, word na *Crocoshia* oorgeplaas. Die welbekende tuinbaster *C. crocosmiflora* word ook beskryf.

Die verwantskap van *Crocoshia* met *Tritonia* en *Chasmanthe* word bespreek en redes word aangegee waarom *Crocoshia* afgeskei van *Tritonia* behoort te bly en as 'n geldige genus aanvaar behoort te word.

Key words: *Crocoshia*, Iridaceae.

INTRODUCTION

Crocoshia is a small African genus of the Iridaceae, subfamily Ixioidae, comprising nine species. It is closely related to *Tritonia* and *Chasmanthe*. The greatest concentration of species is in the eastern parts of the Republic of South Africa, namely Natal, eastern Transvaal and the eastern Cape

Province. The range extends into the north eastern Orange Free State, Lesotho, Swaziland, Mocambique, Zimbabwe, Zaire and Angola, and one species, now transferred from *Chasmanthe*, occurs in the north western Cape Province.

It was only during the second half of the nineteenth century that species of *Crocoscopia* became known in England and Europe. They were described as species of *Tritonia*, and one as a species of *Antholyza*. But in 1850 the French botanist J. E. Planchon became convinced that *C. aurea*, at that time the only species known, did not fit well in *Tritonia*. He established a new genus, *Crocoscopia*, to accommodate it, the name referring to the fact that dried flowers, infused in hot water, emitted an odour of saffron (*Crocus*). The genus was not generally accepted and some investigators returned it to the synonymy of *Tritonia* (see p. 472). It remained monotypic until N. E. Brown (1932) redefined and enlarged the genus to include five species and a hybrid. Even as late as 1971, Goldblatt, although treating it as a genus, was uncertain about its validity. It was thought that the genus differed from *Tritonia* only in its short capsule with few seeds. More differences have now come to light and the genus is here accepted as valid.

In the present study nine species of *Crocoscopia* are recognised, one of which, described from immature specimens, is incompletely known and another, described from specimens at Kew, has not been found in the wild. One species, *C. fucata*, again lately collected in Namaqualand, is now transferred from *Chasmanthe* to *Crocoscopia*. The investigation is based on a study of herbarium material from South African and overseas herbaria, and of fresh material of four of the species and of the hybrid, *C. crocosmiiflora*. The latter, developed about a century ago, occurs as a garden escape in several countries and its description is also included.

MORPHOLOGY

Habit

*Crocoscopia*s are herbaceous, deciduous or sometimes evergreen geophytes, often growing in large clumps. The plants are generally large, varying from 300 mm to well over a metre in height, and sometimes up to 1.8 m. The species are adapted to summer rainfall conditions, sprouting in spring and flowering in summer.

The underground stems are large persistent tunicated corms. New corms are formed annually, but the older corms remain alive for two or more years.

Reproduction is by means of seeds which ripen in autumn, and by axillary buds on the corms which grow out to form long underground stolons from the tips of which new plants develop.

Corms

The corms which are perennial, consist of about six to fourteen internodes. These features are in contrast to most Ixiodeae (also *Tritonia*) in which corms are typically annual and have few internodes. Lewis (1954) discussed four exceptions in the Ixiodeae, namely *Pillansia* and *Dierama* that have persistent corms consisting of a single or few internodes, *Schizostylis* with a rhizome, and *Chasmanthe* with an annual corm comprising numerous internodes. Here then is a fifth exception.

The *Crocasmia* corm is depressed globose, ovoid or shortly ellipsoid, and up to 35–50 mm in diameter. It is usually covered with somewhat broken layers of membranous or papery tunics which are the bases of the cataphylls and basal foliage leaves. Later the intercostal areas in the upper parts of the tunics may break down, leaving coarse parallel fibres which give the older corms a partly fibrous appearance. Still later the tunics may disintegrate totally.

At the beginning of the growing season the apical bud of the corm gives rise to a shoot comprising an abbreviated underground axis of five to seven internodes with a leaf from each node. Later the abbreviated axis becomes swollen with food reserves and forms the new corm. As the older corm does not decay, the two corms are superposed (*C. masonorum*, *C. paniculata*, *C. fucata*).

Flowering does not necessarily occur each year. When it does, the apical bud on the short underground shoot gives rise to a long aerial scape with a terminal inflorescence.

Two distichous rows of axillary buds occur on the corm. Often several of these also develop further: the uppermost axillary bud, or sometimes the two highest buds, may give rise to a shoot similar to that of the apical bud (*C. masonorum*, *C. paniculata*). Or one or more of the buds form a slender underground stolon, 70–200 mm in length and 2–3 mm in diameter, from the end of which a new shoot arises at the beginning of the next growing season (*C. aurea*). In the hybrid *C. crocosmiiflora* which usually produces no viable seeds, both types of axillary bud development may take place.

As the apical bud of the corm at length produces the flowering shoot, further growth of the plant is brought about by the axillary buds. Branching is therefore sympodial, as in other Ixiodeae.

Aerial Stem (Scape)

The scape, varying in length from 300 mm to considerably more than a metre and from 3 to 9 mm in diameter, is strong and rigid. Its lower half is densely covered with long imbricate leaf sheaths. The upper half is naked except for a small number of tiny cauline leaves. It is cylindrical, with the

exception of *C. aurea* where it is 7–10-ribbed, and of the hybrid, *C. crocosmiiflora*, which has two or three ribs.

Leaves

As is characteristic for the Ixiodeae, the leaves are equitant and arranged in two distichous rows. Two to three cataphylls, five to nine basal foliage leaves and a small number of cauline leaves occur. The cataphylls are short and largely bifacial with only the tips sometimes unifacial. They wither early in the growing season. The long, erect or suberect basal foliage leaves are imbricate and crowded together on the short internodes at the base of the axis. As a new corm develops there, their bases form the corm tunics. The cauline leaves on the scape are small, the higher ones being almost bract-like and bifacial.

The basal foliage leaves have unifacial blades which are longer and often much wider than their bifacial leaf sheaths. The blades are linear-lanceolate and 5–20 mm in width (*C. aurea*, *C. pottsii*) or ensiform or narrowly elliptical and up to 80 mm wide across their broadest part, from where they taper to an acute or acuminate tip and downwards to the narrow sheath (*C. massonorum*, *C. mathewsiana*, *C. paniculata*). The blades are plane (flat) in *C. aurea*, *C. pottsii*, *C. crocosmiiflora* and *C. fucata*, and plicate in *C. massonorum*, *C. mathewsiana*, *C. paniculata* and *C. pearsei*. These plicate leaves do not have the ability to fold and expand with varying water contents.

In texture, the leaves are thin and almost papery, mechanical strength being supplied by numerous parallel fibro-vascular strands. The largest strand near the middle of the blade is the pseudo-midrib (Napp-Zinn, 1974; de Vos, 1982a). It is complex, consisting of several fibro-vascular bundles which remain distinct and are separated from one another by narrow zones of chlorenchyma and in the centre of the rib by a mass of colourless water-storing parenchyma. In *C. aurea* the pseudo-midrib is composed of one pair of large opposing bundles with a pair of smaller ones on either side. In *C. mathewsiana* and *C. paniculata* it comprises about eight pairs of large bundles and several small ones in between. Higher up the blade the side bundles of the midrib gradually diverge, thus increasing the number of primary parallel veins in the upper half of the blade. In *C. aurea* and *C. pottsii* the pseudo-midrib (termed middle vein in the systematic section of this article) extends to the leaf tip. In species with plicate leaves on the other hand, this vein is hardly distinguishable from the lateral primary veins in the upper half of the blade.

Leaf anatomy

As is usual in unifacial leaves, all veins have outward facing phloem and inward facing xylem, and a larger or smaller bundle of parenchyma between

phloem and epidermis (de Vos, 1982a). The veins are arranged in pairs in which the two opposing xylem bundles may fuse or remain distinct. In plane leaves the two opposing bundles of each pair are almost equal in size. In plicate leaves they differ in size, the larger bundle of the pair, with a massive strand of sclerenchyma, occurring in the convex angle of each fold and the smaller bundle in the concave angle (Fig. 6b). This latter bundle is often hardly visible externally.

The leaf margins are strengthened by the epidermis only, as in most species of *Tritonia* (de Vos, 1982a). The marginal epidermal cells are small and very narrow and have their anticlinal cell walls thickened to such a degree that the cell lumina are almost obliterated.

Inflorescence

Terminating the scape is a large, laxly branched panicle or sometimes, in young specimens and in *C. aurea* var. *pauciflora*, a simple spike. The panicle usually has from one to five distichously arranged primary and sometimes secondary branches, each subtended by a small narrow bract. The branches, (20–)100–200(–250) mm in length, are more or less straight or curved and flexuose (*C. mathewsiana*) or zigzag (*C. paniculata*). They are ascending in *C. pottsii*, ascending and then spreading and somewhat flexuose in *C. mathewsiana*, and spreading almost at right angles in *C. paniculata*. In *C. masonorum* the main axis is horizontally curved.

The flowers, about six to more than twenty to a branch, are sessile and are subtended by two small spathe valves (bracts) which are largely membranous, almost triangular to shortly elliptical or ovate, often somewhat spreading when drying out, and usually reddish-brown or yellow-brown. The outer bract is acute or obtuse and apiculate, and the inner shortly bidentate and 2-veined. The flowers develop distichously but later often become almost secund, e.g. in *C. mathewsiana*, *C. masonorum* and *C. paniculata*.

Flowers

In most species the flowers are funnel-shaped and zygomorphic, the degree of zygomorphy varying from slight in *C. pottsii* and *C. mathewsiana* to strong in *C. paniculata*, *C. pearsei* and *C. fucata*. In *C. aurea* however, the flowers are almost regular and more or less salver-shaped with widely spreading perianth segments which later become recurved from their bases.

The perianth tube is narrow and tubular in the lower part and usually widens gradually to the mouth which is 4–10 mm in diameter. In *C. aurea* it hardly widens at all. In *C. paniculata* and *C. fucata* the mouth is oblique, with the posticous perianth segment arising 3–5 mm beyond the anticous segment. The perianth tube is slightly shorter than the segments (*C. aurea*),

subequal to (*C. masonorum*), or up to more than twice the length of the segments (*C. paniculata*, *C. fucata*).

The segments are obtuse and usually elliptical (*C. aurea*) or somewhat lanceolate (*C. pottsii*). In *C. aurea* they are almost equal. In other species the median posticous segment is largest and erect (porrect), often arched or slightly concave, thus protecting the anthers. The other five segments are spreading and usually vary only slightly in size, with the three outer segments often slightly smaller than those of the inner whorl. No vestiges of calli occur.

The stamens are inserted in the perianth tube where it widens. In *C. aurea* they are widely exerted and central, whereas in *C. masonorum* they are also widely exerted but inclined towards the posticous side of the flower. In other species, such as *C. pottsii* and *C. mathewsiana*, only the anthers are exerted. Here the anthers are contiguous and inclined towards the posticous segment, facing the anticous side of the flower and dehiscing towards this side. The anthers are linear and versatile, attached about one-third from the base. Below the point of attachment they are bifid.

Nectaries are septal and nectar rises into the perianth tube. Pollination is probably by sunbirds and long-tongued insects.

Except for the length of the style and style branches, the pistil is of little value for distinguishing the species. The trilocular ovary has eight to fourteen ovules in the lower half of each chamber. It is shortly ellipsoid and 3–4(–9) mm long. The long slender style has short style branches which often overtop the anthers. In zygomorphic species the style is usually curved towards the posticous perianth segment. The stigmas are terminal, slightly widened or very shortly bifid and shortly fimbriate.

Capsules

In the capsules important differences between *Crocasmia* and *Tritonia* are to be found. In *Crocasmia* they are hard and somewhat woody, much broader than long, very deeply 3-lobed and often also nodose. Only one or two, or sometimes three or four seeds develop per locule. These are larger than in *Tritonia* and the seed-coat is thicker on account of a broad outer integument which has a thick layer of large, thin-walled water-holding parenchyma cells under its epidermis. These cells later break down when the seeds become dehydrated and the outer epidermal layer, which is smooth and glossy, becomes loose and can easily be rubbed off. This is in contrast to the seed-coats of *Tritonia* and *Chasmanthe*. (See Table 1.) At length the seeds of *Crocasmia* are dull, wrinkled and angled.

Chromosomes

Goldblatt (1971) examined the karyotypes of four species of *Crocasmia*,

namely *C. aurea*, *C. pottsii*, *C. masonorum* and *C. paniculata*, and of the hybrid *C. crocosmiiflora*. (A voucher specimen, Goldblatt 417 in BOL named *C. mathewsiana*, turned out to be another *C. paniculata*.) He found the diploid chromosome number for all to be 22. This confirmed the counts previously made by other workers for *C. aurea*, *C. pottsii*, and the hybrid (see Goldblatt, 1971). The chromosomes are small, ranging from under 2 μm to just less than 3 μm . He recognised six pairs of somewhat larger chromosomes; two of these were metacentric in *C. aurea*, *C. pottsii* and the hybrid. He found the karyotype of *C. paniculata* to be very similar to that of other *Crocoshmia* species. This suggested to him that this species, till then placed in its own monotypic genus *Crotonus*, was indeed a species of *Crocoshmia* with a longer perianth tube and a strongly zygomorphic flower.

After the discovery of fresh material of *C. fucata* in 1983 on the Kamiesberg in Namaqualand, the chromosomes of this species could now also be examined. Here I found a diploid complement of 22 chromosomes, in contrast to the 20 chromosomes Goldblatt recorded (1971) for two species of *Chasmanthe*. As the morphological characters of *C. fucata* also indicate a close relationship with *C. paniculata*, there can be no doubt that this species should be transferred from *Chasmanthe* to *Crocoshmia*, notwithstanding its isolated habitat far from other species of *Crocoshmia*. See under *C. fucata*.

GEOGRAPHY and ECOLOGY (Figs 1, 2)

Crocoshmia species are widespread in the inland summer rainfall regions of the eastern parts of southern and central Africa, from the equator southwards into the eastern parts of the Republic of South Africa (perhaps also north of the equator?). The species with the widest range is *C. aurea* which has been found in Tanzania, Zaire, eastern Angola, eastern Zimbabwe, Mocimboa do Vale, Swaziland, Lesotho, and in the eastern parts of all four South African provinces, as well as in the southern Cape district of George where the type specimens were collected. There is a slight possibility that here the species might have been a garden escape.

Two more species also have a wide range: the high altitude species *C. paniculata* occurs on the Drakensberg range in northern Lesotho, north eastern Orange Free State and eastern Transvaal, and on mountains of Swaziland and eastern Zimbabwe; *C. pottsii* is found at lower altitudes spread over Natal and also in the Transkei.

The following are local endemics occupying very small areas: *C. masonorum* in one district of the Transkei; *C. pearsei* on the Natal Drakensberg; *C. mathewsiana* in a small area of about 50 km on the Drakensberg escarpment of the eastern Transvaal; and *C. fucata* in kloofs of the Kamiesberg in Namaqualand. The latter is the only species of *Crocoshmia* found in the western parts of South Africa.

The locality of *C. latifolia*, described from specimens that were grown in the Royal Botanic Gardens at Kew, is not known, and *C. cinnabarina*, described from an immature specimen, was found only once in eastern Angola. The hybrid *C. crocosmiiflora* is grown world-wide and has become a garden escape in many areas.

Crocoshia species prefer moist habitats such as damp shady places (*C. mathewsiana*), moist vleis (*C. paniculata*), stream banks (*C. aurea*, *C. pottsii*, *C. fucata*), and wooded kloofs and forest margins (*C. aurea*, *C. mathewsiana*).

Most are social, growing in groups or large clumps. An exception is *C. pearsei* which has up until now been found as solitary plants (Obermeyer, 1981). When growing under optimum conditions they may retain their leaves for most of the year. Otherwise their shoots die down in winter and

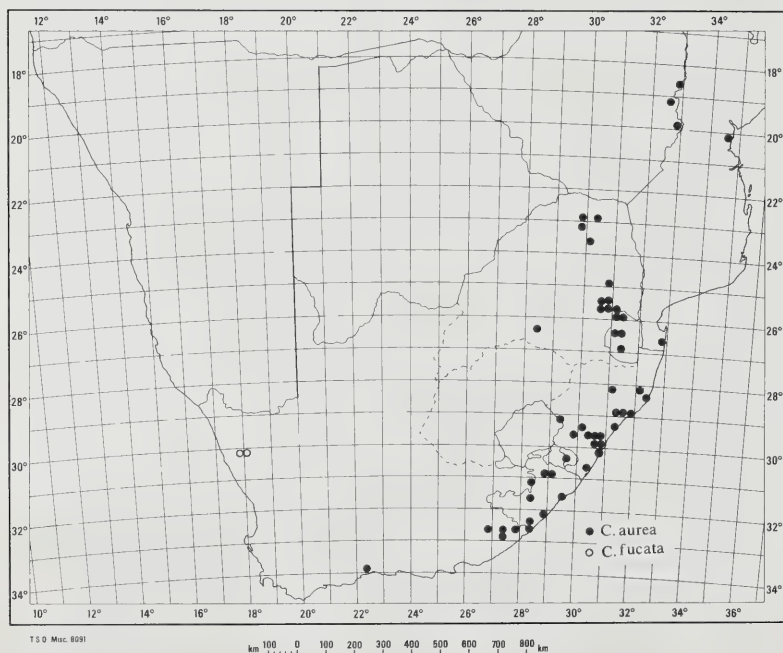


FIG. 1
Geographical distribution in southern Africa, of *Crocoshia aurea* and of *C. fucata*.

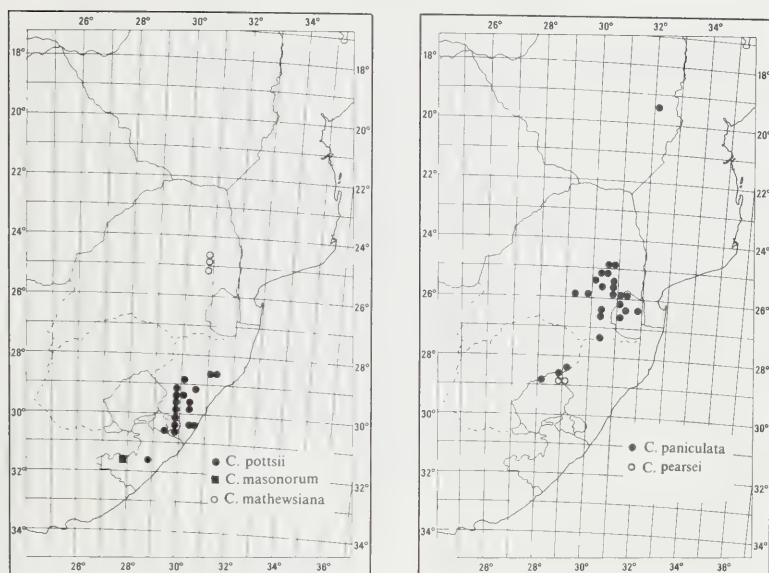


FIG. 2

Geographical distribution of *Crocoshmia masonorum*, *C. mathewsiana*, *C. pottsii*, *C. paniculata*, and *C. pearsei*.

new shoots develop when conditions such as extreme cold or severe drought abate. Flowering is in summer, from November (*C. fucata*) or December (*C. masonorum*) to April (*C. aurea*).

HISTORICAL

Before 1850 only a single species of *Crocoshmia* was known in England and Europe. Specimens collected by "Mr Villett" in the George district as well as a drawing made by him (probably C. J. Villet, flower painter and dealer in natural history material) were sent to Kew in about 1845 by the Cape botanist and physician, Dr. C. W. L. Pappe, as *Tritonia aurea*. This name was published by W. J. Hooker in *Curtis's Botanical Magazine* of 1847. The accompanying figure, t. 4335, is probably that of Villet which accompanied the material.

A few years later the French botanist, J. E. Planchon, convinced that the species did not fit well into *Tritonia*, described a new genus, *Crocoshmia*, to accommodate it (1851–52). He stated that this name referred to the fact that dried flowers of the species, when infused in hot water, emitted a very pronounced odour of saffron (*Crocus*). He was uncertain whether the odour came from the stigmas, as in saffron, or from the perianth, and whether fresh flowers also had this smell (this they do not have).

At first only Klatt (1863) accepted the genus (as *Crocoshma*). Baker (1877) transferred it to *Tritonia* as section *Crocoshma*; Klatt followed suit in 1882 and so did Pax in 1888. It was only after Bentham and Hooker (1883) had reinstated it, as *Crocoshma*, that it became more generally accepted, e.g. by Baker (1892, 1896, 1898), Klatt (1895), Diels (1931), and by N. E. Brown (1932) who redefined the genus and placed another four species in it.

The difference of opinion on the status of *Crocoshmia* again came to the fore when Phillips (1951) reduced it to the synonymy of *Tritonia*. Although Goldblatt treated it as genus in 1971 and again in 1976, he admitted in 1971 (p. 425) that "our knowledge is not yet complete enough to decide whether *Crocoshmia* is a valid genus or not". He treated it as genus for the sake of convenience.

Up to 1932 *Crocoshmia* had remained a monotypic genus. At that time Brown transferred two species (*Tritonia masonorum* and *T. pottsii*) and the hybrid between the latter and *C. aurea*, to it. He also described a new species *C. latifolia* and raised the rank of a variety to that of species (*C. maculata*), thus widening the circumscription of the genus to accommodate species with zygomorphic, funnel-shaped flowers with included filaments and contiguous, unilateral anthers.

C. paniculata was first described as *Antholyza paniculata* Klatt (1865). In 1932 Brown established the monotypic genus *Curtonus* for it when he revised the large and heterogeneous genus *Antholyza*. Goldblatt (1971) found the karyotype of this species to be very similar to that of species of *Crocoshmia* and transferred the species to the latter genus, as its morphological features also indicated such a relationship.

Further work on *Crocoshmia*, after 1932, was fragmentary. Two more species were transferred from *Tritonia* to *Crocoshmia*, namely *T. cinnabarina* transferred by de Vos in 1983, and *T. mathewsiana* regarded as a *Crocoshmia* by Goldblatt (1971). Only two new species were described: *C. pauciflora* by Milne-Redhead in 1948—this is so closely related to *C. aurea* that it is now placed with the latter species as a variety—and *C. pearsei* by Obermeyer in 1981, a species very closely related to *C. paniculata*. Another, originally described as *Tritonia fucata*, has long been regarded as closely related to *C. paniculata* and is now also placed with *Crocoshmia*, notwithstanding its very different habitat in the north western Cape Province.

RELATIONSHIPS and ORIGIN

Crocasmia is closely related to both *Tritonia* and *Chasmanthe*, the latter being one of the genera that Brown (1932) established for some of the species which he excluded from *Antholyza*. Most authors recognised the relationship between *Tritonia* and *Crocasmia* but it was Lewis (1954) who first realised this three-sided relationship. In her phylogenetic scheme (p. 102) she placed *Chasmanthe* at the end of a branch emanating from *Crocasmia*, and *Tritonia* on a separate neighbouring branch, both branches extending from the same hypothetical ancestral source. This means that she regarded *Crocasmia* as standing closer to *Chasmanthe* than to *Tritonia*.

Goldblatt's cytological studies on the Iridaceae (1971) led him to confirm this close relationship of the three genera. He grouped them in subtribe Tritoniineae, together with *Montbretiopsis* which was later included with *Tritonia* (Goldblatt, 1974; de Vos, 1983) and the central African genus *Zygotritonia*, the chromosomes of which he did not investigate.

The present investigation, as well as recent work on *Tritonia* (de Vos 1982b, 1983) and my preliminary work on *Chasmanthe*, confirms the above-mentioned views. I cannot agree with Hutchinson (1959) who placed *Chasmanthe* (as part of *Petamenes*) in the tribe Antholyzeae and *Crocasmia* and *Tritonia* in tribe Gladioleae. Like Lewis (1954) I believe that *Crocasmia* stands closer to *Chasmanthe* than it does to *Tritonia*, as it differs in more respects from the latter than from the former (Table 1).

Considerable specialisation has taken place within each genus and, as each shows both primitive and advanced characters, it is hardly possible to decide which of the three genera is most primitive. The large several-noded, persistent corm of *Crocasmia* can be taken as primitive as it stands nearer the ancestral rhizome of the Ixioidae (cf. Lewis, 1954). On the other hand, the short, few-seeded capsules and seeds with a water-holding testa of *Crocasmia* are specialised, probably for dispersal by birds.

If the distribution of the three genera is considered, *Crocasmia* can again be regarded as the most primitive (see also Goldblatt, 1971), it being mainly a montane genus from the eastern parts of central and southern Africa, adapted to summer rainfall conditions. *Tritonia*, ranging from the eastern parts of southern Africa, through the southern districts where most species occur, into the south western and western winter rainfall areas and into the arid Karoo region, has become adapted to annual dry periods. The small genus *Chasmanthe* is mainly restricted to winter rainfall areas of the southern and western Cape Province and it is also adapted to withstand the hot dry summers that prevail there.

According to chromosome numbers *Chasmanthe* is advanced, with its basic chromosome number of $n = 10$ which probably originated from $n = 11$ of *Tritonia* and *Crocasmia*, through aneuploid reduction (Goldblatt, 1971).

It would probably be best to place each genus at the end of a separate phylogenetic line, all three extending from a common ancestral form. Possibly *Crocoshmia* and *Chasmanthe* were at first on the same line that split at a later date.

TABLE 1
Differences between *Crocoshmia*, *Tritonia* and *Chasmanthe*

	<i>Crocoshmia</i>	<i>Tritonia</i>	<i>Chasmanthe</i>
Corm	Persistent; numerous internodes	Annual; few internodes	Annual; numerous internodes
Corm axillary buds	Numerous in 2 rows	Few	Few
Pseudo-midrib of leaf comprises	Several pairs of large veins	One pair of large veins	Several pairs of large veins
Anthers bifid	In lower third	In lower third or quarter	In lower half
Height of anthers in flower	Equally high	Equally high	One anther higher than other two
Stigmas	Small, terminal	Elongated	Small, terminal
Capsules	Depressed globose, 3-lobed, hard, somewhat woody	Elongated, ellipsoid to obovoid, 3-angled	Shortly ellipsoid, 3-lobed, hard, somewhat woody
Seeds per chamber	1-3(-4)	Numerous	Few
Seed-coat	Thick, outer layers becoming loose	Thin, outer layers persistent	Thick, outer layers persistent
Chromosome number	$2n = 22$	$2n = 22$	$2n = 20$

TAXONOMIC TREATMENT

Crocoshmia Planch. in Fl. des Serres 7: 161 & t. 702 (1851-52); Klatt in Linnaea 32: 764 (1863) & in Dur. & Schinz, Consp. Fl. Afr. 5: 203 (1895), as *Crocoshma*; Bentham & Hooker, Gen. Pl. 3: 707 (1883), as *Crocoshma*; Bak. Handb. Irid. 189 (1892), as *Crocoshma*, & in Fl. Cap. 6: 129 (1896) & in Fl. Trop. Afr. 7: 355 (1898); Diels in Nat. Pflanzenfam. ed. 2, 15a: 491 (1931); N. E. Br. in Trans. Roy. Soc. S. Afr. 20: 264 (1932); Goldbl. in Jl S. Afr. Bot. 37: 420 (1971) & in Dyer, Gen. S. Afr. Flow. Pl. 2: 973 (1976); Compton in Jl S. Afr. Bot. Suppl. Vol. 11: 140 (1976). Type species: *C. aurea* (Pappe ex Hook.) Planch.

Tritonia Ker-Gawl. sensu Hook. in Curtis's Bot. Mag. **73** t. 4335 (1847); E. P. Phill. Gen. S. Afr. Flow. Pl. ed. 2, **219** (1951), partly.

Tritonia Ker.-Gawl. sect. *Crocoshia* (Planch.) Bak. in J. Linn. Soc. **16**: 163 (1877); Klatt in Abh. Naturf. Ges. Halle **15**: 358 (1882); Pax in Nat. Pflanzenfam. **2** (5): 15 (1888).

Crocoshia Klotzsch ex Klatt in Peter's Reise Mossamb. Bot. **2**: 516 (1863). Type species: *C. mossambicensis* Klotzsch ex Klatt.

Curtonus N. E. Br. in Trans. Roy. S. Afr. **20**: 270 (1932); E. P. Phill. Gen. S. Afr. Flow. Pl. ed. 2, **221** (1951); Goldbl. in Jl S. Afr. Bot. **37**: 420 (1971). Type species: *C. paniculatus* (Klatt) N. E. Br.

Geophytes of medium height or up to more than a metre tall, mostly deciduous. *Corms* persistent, medium to large, depressed globose to shortly ovoid or ellipsoid, often superposed in rows of 2–4 or connected by long slender stolons; tunics membranous, later often fibrous or disintegrating. *Scape* erect, strong, cylindric or sometimes ribbed, the lower half covered with imbricate leaf sheaths. *Basal leaves* several, large, equitant-unifacial, linear-lanceolate to elliptic-ensiform and tapering to an acuminate tip and to a narrow base, plane or plicate, glabrous, usually with several primary veins; cauline leaves few, small, largely bifacial. *Inflorescence* a large, laxly branched panicle, each branch with few to numerous distichous or secund flowers, or sometimes a simple spike. *Bracts* small, membranous to subherbaceous, shorter than the perianth tube; *outer* acute or obtuse and apiculate; *inner* bidentate, 2-veined, subequal to the outer. *Flowers* zygomorphic to almost regular, funnel-shaped or salver-shaped, bright orange-yellow to brick-red. *Perianth tube* tubular or funnel-shaped, widening gradually, often slightly curved, sometimes with an oblique mouth; *segments* usually elliptical, obtuse, almost equal and spreading or recurved, to very unequal with the posticous segment largest and porrect and other segments spreading. *Stamens* inclined towards the posticous segment or sometimes central and exserted; *anthers* linear, versatile, bifid from the base for one-third of its length, often contiguous and unilateral. *Ovary* 3-chambered, shortly ellipsoid, with 8–14 ovules per chamber; *style* long, filiform, with three short spreading branches; *stigmas* three, terminal, small, slightly cuneate or minutely bifid. *Capsules* depressed globose-trigonous, broader than long, rather woody; *seeds* 1–2(–4) per chamber, globose or angled, testa at first smooth, later wrinkled. *Chromosome number* $2n=22$ (Goldblatt, 1971).

The genus could perhaps be divided into two sections, with *C. aurea* with its almost regular flowers in one section and the other species which all have zygomorphic flowers in another section. As the genus is so small, and as hy-

brids have often been obtained between *C. aurea* and *C. pottsii* which would belong to the first and second sections respectively, a division into sections has been omitted.

KEY TO THE SPECIES

1. Perianth tube less than twice the length of the segments:
 2. Leaves usually up to 20 mm wide, rarely to 30 mm, plane, linear-lanceolate, with numerous closely spaced slender veins and a prominent vein up to the leaf tip:
 3. Flowers zygomorphic, perianth tube widely funnel-shaped; filaments 8–12 mm long 4. *C. pottsii*
 3. Flowers almost regular or only slightly zygomorphic; perianth tube largely tubular, widening only slightly; filaments 15–40 mm:
 4. Perianth almost regular, salver-shaped with horizontally spreading or recurved segments; stamens and style widely exerted, more or less central; peduncle 7–10-ribbed 1. *C. aurea*
 4. Perianth slightly zygomorphic, funnel-shaped, with spreading segments; stamens and style somewhat exerted, placed slightly towards the posticous segment; peduncle 2–3-ribbed 9. *C. crocosmiiflora*
 2. Leaves usually more than 30 mm wide, narrowly elliptical, plicate, tapering to an almost stalk-like base, with numerous prominent widely spaced veins and a vein prominent in the lower part of the leaf near the middle:
 5. Inflorescence a horizontally curved spike with flowers second on the upper side, rarely with 1–2 branches 3. *C. masonorum*
 5. Inflorescence a large laxly branched panicle with distichous or second flowers:
 6. Flowers distichous, almost salver-shaped, with widely exerted stamens and style 2. *C. latifolia*
 6. Flowers second, funnel-shaped, with only the anthers and style branches exerted 5. *C. mathewsiana*
1. Perianth tube at least twice the length of the segments:
 7. Panicle with ascending branches, rarely a spike; perianth tube widely funnel-shaped; filaments 8–12 mm long 4. *C. pottsii*
 7. Panicle with almost horizontal branches, sometimes a spike; perianth tubular in the lower half, funnel-shaped in the upper; filaments 25–40(–50) mm long:
 8. Leaves plicate; panicle or few-branched spike; Drakensberg range:
 9. Branches of panicle strongly zigzag in their upper part; flowers up to 75 mm long; plants in large clumps 6. *C. paniculata*
 9. Branches of spike straight or faintly zigzag; flowers 70–90 mm long; plants solitary 7. *C. pearsei*
 8. Leaves plane; usually a spike, often with 1–2 branches; Kamiesberg range 8. *C. fucata*

1. *Crocoshmia aurea* (Pappe ex Hook.) Planch. Fl. Serres Ser. 1 (7): 161 & t. 702 (1851–52).

Plants (450–)600–1 000(–1 300) mm high. *Corms* depressed globose or shortly ovoid, (10–)15–20 mm diam., connected by underground stolons up

to 180 mm long; tunics membranous, almost papery, brown. *Scape* (450-)600-1 000(-1 300) mm long, erect or suberect, rigid, 7-10-ribbed. *Basal leaves* several, plane, linear-lanceolate, (200-)400-600(-1 200) × (8-)10-20(-30) mm, tapering to an acute or acuminate tip and downwards to the narrow sheath, with a strong middle vein, thin-textured with a slight silky sheen when dry; *cauline leaves* smaller, upper ones bract-like. *Inflorescence* a rather lax, often slightly flexuose panicle 100-200(-300) mm long, rarely a simple spike (var. *pauciflora*), with several ascending-spreading, often slightly wavy branches 20-60 mm long, with (3-)5-10 flowers to a branch. *Bracts* subherbaceous, orange-brown to orange-yellow, almost triangular, (4-)7-10(-15) mm long, tips usually slightly spreading; *outer* acute or acuminate or 2-3-toothed; *inner* bidentate with acuminate teeth, 2-veined and 2-keeled in upper part. *Flowers* regular, salver-shaped, (20-)35-50(-65) mm long, bright golden-orange or reddish-orange (RHS 23A, 28A, 30A). *Perianth tube* tubular, curved, (10-)20-27 mm long, hardly widened upwards, bright orange, shorter than the segments; *segments* subequal, narrowly elliptical, obtuse, spreading horizontally, later strongly recurved from the base, (12-)25-35(-40) × (4-)6-10 mm, outer often eared at the base, inner sometimes with inrolled margins near the base, rarely with a large dark blotch near the base. *Stamens* well exerted, placed centrally; *filaments* (15-)25-35(-40) mm, pale yellow; *anthers* (3-)6-10 mm long, orange, pollen orange. *Style* well exerted, almost central, (22-)35-45(-60) mm, yellow, branches 4-8 mm, orange; *stigmas* at or above the anther tips. *Capsules* depressed globose-3-lobed, nodose, reddish-orange, later deeply 3-lobed, 12-15 mm diam., much wider than long; *seeds* 1-2(-4) per locule, at first globose, blue-black, glossy, 4-6 mm diam., later wrinkled and angled. *Chromosome number* $2n = 22$ (Goldblatt, 1971, for var. *aurea*).

Flowering period: (December to) February to March (to April) and to June in Malawi.

Distribution: widely distributed in the eastern parts of southern and central Africa, in moist places such as forest margins, wooded kloofs, south-facing slopes and along river banks. Fig. 1.

This very distinct species of *Crocosmia* is distinguished by its almost regular, star-like, intensely coloured flowers with spreading and later often recurved perianth segments which are somewhat longer than the slightly curved tubed, and by long, well-exserted and more or less centrally placed stamens and style. The golden-orange colouration of the flowers is usually well preserved in herbarium specimens. The leaves are rather soft and thin-textured and have in herbarium specimens an almost papery texture with a silky sheen. This readily distinguishes the species from its nearest relation, the hybrid *C. crocosmiiflora*.



FIG. 3

Crocosmia aurea a, panicle, diagrammatic; b, peduncle in transverse section; c, flower, side view and median section; d, anther, style branches and stigmas; e, outer (left) and inner (right) bract; f, capsules; g, corm with tunics (left) and with tunics removed (right); n, nodes; s, scale leaf on stolon. (de Vos 2449)

Specimens collected by a Mr Villet in the southern Cape district of George were sent to Kew by Dr Pappe of Cape Town, together with Villet's coloured drawing, and were described by W. J. Hooker (1847).

Two taxa, previously described as separate species, are now incorporated with *C. aurea* as varieties. The one, *pauciflora*, differs only in its fewer and smaller flowers, and the other in the perianth with dark blotches in the throat.

KEY TO THE VARIETIES

1. Inflorescence a compound, many-flowered panicle; flowers longer than 35 mm, rarely only 30 mm; style longer than 30 mm:
 2. Flowers without dark blotches a. var. **aurea**
 2. Flowers with a dark blotch near the base on the inner perianth segments b. var. **maculata**
1. Inflorescence a simple, few-flowered spike; flowers 20–30 mm long, rarely to 35 mm; style 22–27 mm c. var. **pauciflora**

a. var. **aurea**

Crocoshmia aurea (Pappe ex Hook.) Planch. Fl. Serres, Ser. 1 (7): 161 & t. 702 (1851–52); Klatt in Linnaea 32: 764 (1863) & in Dur. & Schinz, Conspect. Fl. Afr. 5: 203 (1895), as *Crocoshmia*; Bak., Handb. Irid., 189 (1892) as *Crocoshmia* & in Fl. Cap. 6: 129 (1896) & in Fl. Trop. Afr. 7: 355 (1898); Diels in Nat. Pflanzenfam., ed. 2, 15a: 491 (1931); Compton, J. S. Afr. Bot. Suppl. 11: 140 (1976).

Tritonia aurea Pappe ex Hook. in Curtis's bot. Mag. 73 t. 4335 (1847); Bak. in J. Linn. Soc. 16: 163 (1877); Klatt in Abh. Naturf. Ges. Halle 15: 358 (1882). Type: Cape, George, *Pappe s.n.* (in Herb. Hooker, K, holo.-; *Pappe* SAM 21194 (SAM, iso.-?))

Crocoshmia mossambicensis Klotzsch ex Klatt, in Peters, Reise Mosamb. Bot. 2: 516 (1863). Type: not seen.

Babiana aurea Klotzsch in Allg. Gartenz. 293 (1851) – f. Morren in Belg. Hort. p. 299 (1881). Type: not seen.

Icones: Curtis's bot. Mag. t. 4335; Fl. Serres Ser. 1 (7) t. 702; Bot. Reg. 33 t. 61; Letty, Wild Flowers of Transvaal Pl. 37/2; Trauseld, Wild Flowers of Natal Drakensberg p. 44; this work Fig. 3.

Plants 500 mm or higher. *Inflorescence* a many-flowered lax panicle with upward spreading, slightly wavy branches. *Bracts* (5–)7–10(–15) mm long. *Flowers* (30–)50–65 mm long. *Perianth tube* (15–)20–27 mm long. *Filaments* (20–)25–35 mm. *Style* 30–45(–60) mm.

TRANSVAAL—2229 (Waterpoort): Soutpansberg 6 km W of main road (–DD), Rodin 4026 (PRE, K); Hangklip. *Gerstner* 5904 (PRE); NE of Louis Trichardt. Tölken 1200 (SRGH).
—2230 (Messina): Sibasa (–CD), Hemm 536 (PRE, MO).

- 2329 (Pietersburg): Louis Trichardt distr. (-BB), *Koker* 25 (PRE), *Rodin* 4026 (MO).
- 2330 (Tzaneen): Farm Vreedsaam, Mooketsi Valley (-CA), *Killick & de Winter* 8926 (PRE); Duiwelskloof, Letaba, *Scheepers* 619 (PRE); Westfalia Estate, *Bos* 1343 (STE, K).
- 2430 (Pilgrim's Rest): Near Graskop (-DD), *Van der Merwe* 331 (NBG, PRE); Kowyns Pass, *Kluge* 1686 (PRE).
- 2530 (Lydenburg): Wonderboom Nature Reserve (-BC), *Elan-Puttick* 325 (PRE); Witkop-plantasie (-BD), *Kluge* 486 (PRE); Starvation Creek Nature Reserve (-DA), *Kluge* 1247 (PRE).
- 2531 (Komatipoort): Mt Sheba (-CA), *Jones & Leach* 19 (PRE); Around Barberton (-CC), *Galpin* 805 (BOL, GRA, K); Near Rimer's Creek, Barberton, *Balsinhas* 3152 (PRE); Havelock, *Bayliss* 2739 (NBG).
- 2628 (Johannesburg): Heidelberg (-AD), *Bonsma* 8189 (PRE).
- NATAL—2831 (Nkandla): Shongweni Dam (-AA), *Morris* 797 (NU); Eshowe (-CD), *Lawn* 190 (NH); Mtunzini distr. (-DC), *Wells & Edwards* 104 (NU); Umlalazi Nature Reserve (-DD), *Ward* 4597 (NH).
- 2832 (Mtubatuba): Hluhluwe Game Reserve (-AA), *Ward* 3062 (NH, NU); Game Park St Lucia Estuary (-AD), *Posley s.n.* (NU).
- 2929 (Underberg): Cathkin Park, Drakensberg (-AB), *Howlett* 111 (NH); Giants Castle Game Reserve, *Trauseld* 338 (NU); Deepdale (-DB), *Evans* 87, 216 (NH).
- 2930 (Pietermaritzburg): Karkloof, Lions River (-AC), *Moll* 3441 (NH); Inchanga Hill (-DA), *Burt & Hilliard* 3799 (NU); Ismont Mt. (-DC), *Strey* 8365 (NH); Crest-holme, Hillcrest (-DD), *Coleman* 76 (NH); Pinetown, *Drummond* NH 67252 (NH).
- 2931 (Stanger): Kearnsey (-AD), *Milner* NH 23452 (NH); Wentworth, Durban distr., *Ward* 6124 (NH, NU).
- 3030 (Port Shepstone): Umbogintwine (-BB), *Forbes* 1215 (NH).
- CAPE—3028 (Matatiele): Mount Frere (-DD), *Acocks* 12551 (PRE).
- 3029 (Kokstad): Insizwa forest floor (-CC), *Strey* 10785 (NH, NU, MO, PRE); Zuurberg nr Kokstad (-BC), *Tyson* 1701 (GRA, SAM).
- 3128 (Umtata): Maclear (-AB), *Martinson* NBG 447/28 (NBG); Baziya (-CB), *Baur s.n.* (GRA), BOL 3203 (BOL), *Thode* 5315 (STE), *Baur* 31 (SAM, K), *Flanagan* 267 (GRA), *Mauve* 4865 (PRE).
- 3129 (Port St Johns): Port St Johns (-DA), *Howlett* 32 (PRE), *Galpin* 11443 (PRE).
- 3226 (Fort Beaufort): Hogsback Forest Res. above Alice (-DB), *Dahlstrand* 2927 (PRE).
- 3227 (Stutterheim): Dohne (-CB), *Sim* 19884 (PRE); Izeleni, *Sim* 19921 (PRE); 18 mls from Stutterheim towards Grahamstown (-CD), *Van Breda* 858 (PRE); Komga (-DB), *MacOwan* 1543 (SAM), *Flanagan s.n.* (SAM 21196).
- 3228 (Butterworth): Willowvale, Dunessa Forest (-AD), *Wood* 165 (NH, NU); The Haven, Elliotdale distr. (-BB), *Gordon-Gray* 468 (NU); Kentani distr. (-CB), *Pegler* 339 (NU), NBG 239/13 (BOL).
- 3322 (Oudtshoorn): George (-CD), *Pappe s.n.* (K), *Pappe s.n.* (SAM 21194); Vlei near George, *Viviers* 130 (STE).

Without precise locality: Tembuland, *Marloth* 8044 (PRE).

TANZANIA: Distr. Lindi, Mucra Plateau, *Schlieben* 5981 (SRGH); 61 mls S of Iringa, *Pollhill & Paulo* 1713 (K, SRGH); Ukaguru Mts., Kilosa distr., *Thulin & Mhoro* 2764 (K); Lupembe Hills, Matenga, *Milne-Redhead & Taylor* 9011 (K); Near Msalanga, *Bally* 7922 (K); Lushoto distr., *Drummond & Hemsley* 3178 (K); Morogoro, *Schlieben* 3201 (MO).

ZAMBIA: North Western Province, Mwinilunga distr., *Brummitt e.a.* 14013 (SRGH).

MALAWI—1033 Nyika Plateau (-DB), *Brummitt 10889* (SRGH); Juniper Forest, *Salubeni 3053* (MO).

—1133 Mzimba distr., Vipya, *Pawek 1784* (K).

—1134 Nkhata Bay, Mzuzu (CA-CB), *Pawek 5312* (SRGH), 8322 (MO).

—1234 Kotakota, *Jackson 1103* (K).

—1535 Zomba Plateau (-AD), *Brummitt 9127* (K).

—1735 Port Herold (-AA), *Phipps 2629* (SRGH).

ZIMBABWE—1832 (Umtali): Honde Valley nr Ruda River (-DB), *Plowes 2080* (SRGH).

—1932 (Melsetter): Stapleton near Meikle Forest Station (-BA), *Müller 2981* (SRGH); Vumba, *Chase 5488* (SRGH); Melsetter (-DD), *Crook 455* (SRGH), *Hall 424* (SRGH), *Chase 4841* (MO).

MOCAMBIQUE—2034 (Nova Sofala): Manica e Sofala (-BA), *Exell e.a. 319* (SRGH), *Müller 1154* (K); Chimanimani Mts., *Hall 424* (BOL).

—2632 (Bela Vista): Lourenco Marques (-DC), *Gomes e Sousa 5055* (PRE).

SWAZILAND—2531 (Komatipoort): Piggs Peak (-CC), *Bayliss 5619* (C, MO).

—2631 (Mbabane): Ukutula, *Compton 2567* (NBG); Hill NW of Mbabane (-AC), *Dlamine* (NBG); Mdimba (-AD), *Kemp 683* (MO); Hlatikulu (-CD), *Stewart 92* (K), 9349 (SAM).

The flowers of the holotype in Hooker's herbarium in Kew have retained their bright orange-yellow colouring for almost 140 years. A Pappe specimen in the Compton Herbarium in Kirstenbosch (SAM 21194) labelled "In provincia George" is identical with the holotype and can probably be regarded as an isotype.

The species does very well in gardens and was probably widely cultivated in England and Europe after its introduction in the nineteenth century. Hooker (1847) considered it to be the most beautiful of all *Tritonias* and Diels (1931) called it "geliebte Zierpflanze". Horticulturalists in South Africa know it as "Falling Stars". In regions with suitable climates it can possibly escape from gardens into the wild, especially as the seeds are distributed by birds. For example, the specimen *Morton K855* in Kew, from Mann's Springs, Cameroon Mts., British Cameroons, has a note on its label, "A relict of cultivation". The type locality, which is George in the southern Cape Province, is almost 500 km distant from its other habitats, and a question that cannot now be answered is whether the George specimens are perhaps garden escapes. The species still occurs near George where it was found again in 1982 (*Viviers 130* in STE).

The capsules dehisce widely, exposing the blue-black glossy seeds (1 to 3 or rarely 4 per locule). These remain in position until disturbed by birds. The outer integument of the testa has an inner layer of large, thin-walled cells that store water. Later the thin cell walls of this layer break down and the glossy outer layer of the testa is sloughed off, leaving the seeds with a dull, shrivelled surface.

b. var. **maculata** Bak. in Gard. Chron. 4: 407 & 565 & Fig. 80 (1888) & Handb. Irid. 189 (1892) & in Fl. Cap. 6: 129 (1896). Type: locality unknown; from the garden of Mr O'Brien, Sept. 1888 (K, holo.).

Crocasmia maculata (Bak.) N. E. Br. in Trans. Roy. Soc. S. Afr. 20: 264 (1932).

Characters as in var. *aurea* except for the following: *inner perianth segments* each with a red-brown blotch above a claw-like base.

Distribution uncertain. The following specimens may perhaps represent this variety:

TRANSVAAL—2530 (Lydenburg): Kaapse Hoop (-DB), *Thorncroft* 2004 (PRE).

The collection of *Herbst s.n.* in NBG and STE, from Pietermaritzburg, is said to have had a red pattern in the throat. This was previously identified as var. *maculata*, but the red pattern does not correspond to the original description and figure of the variety. This collection is possibly *C. crocosmiflora* which often shows a red pattern in the throat of the perianth.

c. var. **pauciflora** (Milne-Redhead) De Vos, stat. nov.

Crocasmia pauciflora Milne-Redhead in Kew Bull. 1948: 469. Syntypes: Zambia, Mwinilunga distr. by R. Kaoomba, *Milne-Redhead* 3783 (K, lecto.; PRE); Angola, Moxico distr. by R. Kampashi, *Milne-Redhead* 4228 (K).

Plants up to 600 mm high, unbranched. *Inflorescence* a lax, 4–7-flowered spike with the axis in fruiting specimens often bent at the nodes. *Bracts* ca. 4 mm long. *Flowers* 20–25(–35) mm long. *Perianth tube* 10–15 mm long; *outer segments* recurved, 15–18 mm long. *Style* 22–27 mm. *Immature capsule* obscurely 3-lobed.

Flowering period: December to February.

Distribution: Zaire, Zambia and eastern Angola.

ZAIRE: Kabare, *Christiaensen* 1252 (MO); Bururi, *Lewalle* 3465 (MO).

ZAMBIA: NW Province, Mwinilunga distr.: Uapaca Woodland, *Hooper & Townsend* 279 (SRGH, C, K); R. Kaoomba, *Milne-Redhead* 3783 (PRE, K); West Lunga River, *Brummit e.a.* 14013 (SRGH, K).

ANGOLA: Moxico distr. by R. Kampashi, *Milne-Redhead* 4228 (K); Amboim, Capir, *Gossweiler* 10053 (LISC); Parc nat. de la Garamba, *Troupin* 2015 (K); Haut Katanga near Elizabethville, *Quarré* 4571 (K).

This variety, found only a few times, differs from the typical variety only in its spike with fewer, smaller flowers. Intermediates between this variety and var. *aurea* occur, such as *Robinson* 4373 in K, from the Chishimba Falls,

Kasama district in Zambia which has eight flowers up to 37 mm long; and Hall 424 in BOL, from the Chimanimani Mountains, Mocambique, has flowers as small as in this variety, but an inflorescence as in var. *aurea*. This is now placed with var. *aurea*.

C. cinnabarina may perhaps be identical with var. *pauciflora*. See under SPECIES INCOMPLETELY KNOWN.

2. *Crocoshia latifolia* N. E. Br. in Trans. Roy. Soc. S. Afr. **20**: 264 (1932). Type: Brown noted: "Described from cultivated specimens. Collector and locality unknown". Two specimens in K are designated as type specimens in Brown's hand. Both are from Comm. Van Tubergen Jnr, dated 18-8-04 and 27-8-04 respectively. The latter is chosen here as lectotype.

Plants probably 500-1 000 mm high. *Corms* not seen. *Scape* stout, apparently dull violaceous-green. *Basal leaves* several, lanceolate-ensiform, 300-450 × 20-40 mm, tapering from the middle to an acute or acuminate tip and a narrow base, with a strong middle vein and several more veins; *cauline leaves* few, smaller. *Inflorescence* a laxly branched panicle, each branch curved, with numerous fairly laxly and distichously arranged flowers. *Bracts* membranous, dark reddish-brown, 10-15 mm long; *outer* apiculate with a stronger median vein; *inner* bidentate with acuminate teeth, 2-veined. *Flowers* slightly zygomorphic, somewhat salver-shaped, 35-45 mm long, bright orange-red. *Perianth tube* narrowly funnel-shaped, slightly curved, 15-25 mm long, widened gradually from the base to 5 mm diam. at the throat; *segments* unequal, oblong, obtuse, spreading, 15-22 × 5-8 mm, the median posticous segment largest, the outer segments slightly eared at the bases. *Stamens* well exerted, about as long as the perianth segments; *filaments* ca. 17-20 mm; *anthers* 7-8 mm, yellow, pollen pale. *Style* 25-40 mm, exerted, branches 4-5 mm; *stigmas* widened, minutely fimbriate.

Flowering period in England: August.

This species was grown in the Van Tubergen nurseries in England and may perhaps be of hybrid origin. Plants sent to Kew were described by Brown. These are clearly related to *C. aurea* and *C. masonorum*, resembling the former in its flowers with narrow, slightly curved perianth tube, spreading segments and exerted stamens and style, differing in its slightly zygomorphic flowers and wider leaves with coarser veins. The leaves are apparently flat but have primary veins typical of plicate leaves; that is, the two veins of each pair of veins are unequal in size, the larger and smaller veins alternating towards the two leaf surfaces.

The species also resembles *C. masonorum* from the Engcobo district in

Transkei, in its wide leaves and slightly zygomorphic flowers, but differs in its lax panicle with ascending branches and distichous flowers.

C. latifolia is not known in the wild and may perhaps in future be treated as a dubious species.

3. *Crocoshia masonorum* (L.Bol.) N. E. Br. in Trans. Roy. Soc. S. Afr. **20**: 264 (1932).

Tritonia masonorum L.Bol. in Ann. Bol. Herb. **4**: 43 (1926). Syntypes: Tembuland, Engcobo Mt., 4500 ft, *H. Bolus 10303* (BOL, lecto.-); Near Satana Nek, mts between Engcobo & Zidungeni, *Mason & Mason* (K, icon).

Icons: Elovson, S. Afr. Wild Fls. Gard. **98** (1973); an unpublished water colour drawing by Miss M. H. Mason in K; this work Fig. 4.

Plants 500–750 mm or higher. *Corms* several, subglobose, superposed one upon another, 20–25 mm in diam.; tunics soon disintegrating. *Scape* 500–750 mm long, robust, cylindrical, polished. *Basal leaves* several, plicate, elongated-elliptical, up to 600 mm $\times$ 20–50 mm, tapering gradually to an acuminate tip and a narrow stalk-like base ca. 5 mm wide, with a strong middle vein only in the lower part of the blade, and 6–12 more veins; cauline leaves up to 5, the lower imbricate, the upper distant and smaller. *Inflorescence* a simple or sometimes 1–2-branched spike with ascending branches, the main axis curved, with numerous flowers secund on the upper side of the curve, sometimes in approximating pairs. *Bracts* membranous, oblong to ovate, 4–10 mm long; *outer* shortly apiculate or acute; *inner* minutely bidentate, 2-veined in the upper part. *Flowers* slightly zygomorphic, funnel-shaped, later somewhat salver-shaped, 40–60 mm long, scarlet-orange to orange-yellow, drying to a brownish-yellow. *Perianth tube* funnel-shaped, slightly curved, 18–25 mm long, narrow in the lower half, widening gradually to 5–10 mm diam. at the throat; *segments* slightly unequal, elliptic, obtuse, spreading, at length somewhat recurved, 20–30 mm long, about as long as the tube or slightly longer, the three outer 5–7 mm wide, inner larger and 7–12 mm wide, with the posticous segment largest. *Stamens* well exerted, somewhat unilateral or spreading randomly; *filaments* 30–35 mm; *anthers* 7–9 mm, usually overtopping the perianth segments. *Style* well exerted, 42–45 mm; branches 2–4 mm, often overtopping the anthers; *stigmas* slightly widened or shortly bifid, fimbriate. *Capsules* depressed globose-3-lobed, 7 $\times$ 9 mm; *seeds* wrinkled, 4 mm in diam. *Chromosome number* $2n = 22$ (Goldblatt, 1971).

Flowering period: December to January.

Distribution: on mountains in the Engcobo district of Transkei, probably rare. Fig. 2.



FIG. 4

Crocoscopia masonorum. a, spike, diagrammatic; b, flower; c, style branches, stigmas and anther; d, outer (left) and inner (right) bract; e, capsules; f, corms with tunics removed. (de Vos 2580)

TRANSKEI—3127 (Lady Frere): Engcobo Mt. (-DB), *Flanagan* 2731 (PRE), *H. Bolus* 10303 (BOL); Near Satana Nek, *Mason & Mason s.n.* (K, drawing).

Without locality, flowered in Kirstenbosch, *Milton* NBG 62866. STE 31365. Ex hort. Milton, Cala, *Milton s.n.* (MO); Ex hort. Transvaal, *de Vos* 2580 (STE).

This rare species probably has a very limited distribution and has thus far been found only a few times, perhaps owing to the inaccessibility of the terrain, on the southern extremities of the Drakensberg range in Transkei. It is, however, grown in some gardens in the Transvaal where it is known as Golden Swan *Crocoscopia* (Eliovson, 1973).

It is distinguished by its large pleated leaves and horizontally curved peduncle with all the flowers arranged on the upper side. The flowers are only slightly zygomorphic and open widely exposing the long stamens and style. The inner perianth segments are larger than the outer and the posticous segment largest. It stand nearest *C. mathewsiana* and differs from this in its inflorescence and flowers. In its vegetative stage it cannot be distinguished from either *C. mathewsiana* or *C. paniculata*.

4. *Crocosmia pottsii* (M'Nab ex Bak). N.E. Br. in Trans. Roy. Soc. S. Afr. **20**: 264 (1932).

Gladiolus pottsii M'Nab in Hort. Edinb., nom. nud.

Montbretia pottsii M'Nab ex Bak, in Gard. Chron. **8**: 424 (1877) & **11**: 525 (1880); Morren in Belg. Hort. **31**: 300 (1881). Type: Ex C.B.S., Hort. M. Leichtlin, Baden-Baden (K, holo.-).

Tritonia pottsii (M'Nab ex Bak.) Bak. in Curtis's Bot. Mag. **109** sub t. 6722 (1883) & Handb. Irid. 195 (1892) & in Fl. Cap. **6**: 127 (1896) excl. cit. Herb. Bolus 2652.

Icones: The Garden **84** (1880); Curtis's bot. Mag. t. 6722 (1883); Batten & Bokelmann, Wild Fls. E Cape Prov. Pl. 33 fig. 2a; this work Fig. 5.

Plants 700–1 000(–1 200) mm or higher. *Corms* depressed globose, 20–25 mm in diam., often two or more in a vertical row or connected by long slender stolons; tunics brown, papery or sometimes somewhat fibrous. *Scape* 700–1 000 mm or longer, erect, strong, cylindrical. *Basal leaves* several, plane linear-lanceolate, (100–)500–800 mm or longer $\times$ (5–)8–15(–18) mm, acuminate, with a prominent middle vein and several

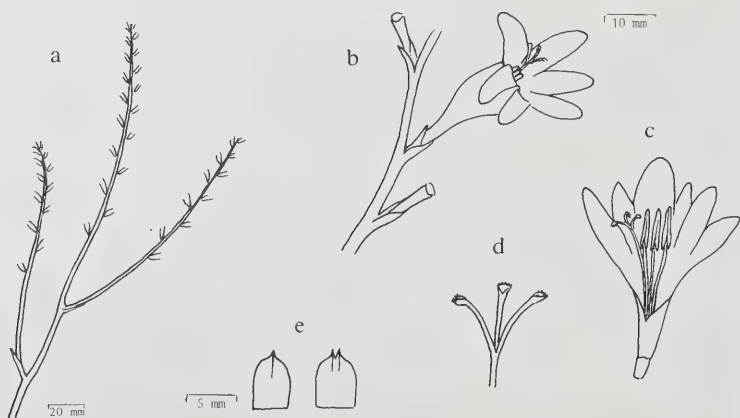


FIG. 5

Crococsmia pottsii. a, panicle, diagrammatic; b, flower; c, flower, split open; d, style branches and stigmas; e, outer (left) and inner (right) bract. (NBG 382/32)

more closely spaced veins, firm in texture; cauline leaves 2–3, up to 200 mm long. *Inflorescence* a lax panicle 150–350 mm long, with 1–3(–5) ascending, more or less straight or later faintly zigzag branches 150–200 mm long, each with numerous fairly laxly arranged, distichous flowers; or sometimes a simple spike up to 320 mm long. *Bracts* membranous, reddish-brown, ovate, 4–8 mm long; *outer* obtuse or acute or bluntly toothed; *inner* bidentate with short acuminate teeth, 2-veined, with papery margins. *Flowers* zygomorphic, funnel-shaped, 28–35(–40) mm long, bright deep-orange or orange-yellow, more or less flushed with brick-red on the outside. *Perianth tube* funnel-shaped, slightly curved, 14–20 mm long, slightly less than twice the length of the segments, narrow in the lower third, widening to 7–10 mm diam. at the mouth; *segments* unequal, obtuse, $8-15 \times 5-7$ mm, outer lanceolate, inner oblanceolate or elliptical, the posticous segment erect, slightly longer than the other five which spread slightly. *Filaments* 8–12 mm, slightly curved to the posticous side; *anthers* contiguous, 6–7 mm long, scarcely exerted from the perianth tube, pale. *Style* 20–30 mm, orange; branches 2–3 mm long; *stigmas* slightly widened or shortly bifid, minutely fimbriate, overtopping the anthers. *Capsules* shortly obovoid to subglobose-deeply 3-lobed, up to 8 mm in diam. (immature). *Chromosome number* $2n = 22$ (Goldblatt, 1971).

Flowering period: (November to) December to February.

Distribution: widely distributed in inland Natal to the Drakensberg, including Griqualand East, and also in Transkei; often on stream banks. Fig. 2.

NATAL—2830 (Dundee): Weenen County (-CC), *Acocks 13980* (PRE).

—2831 (Nkandla): Nkandla (-CA), *Gerstner 619* (PRE); Melmoth (-CB), *Mogg 6234* (PRE).

—2929 (Underberg): South Downs (-BB), *Evans 491* (NH); Prope Mooi River, *M.-Wood 5222* (PRE, Z); Rosetta (-BD), *Young NH 20999* (NH); Boston, Impendhle (-DB), *Beattie 29* (NU); Mawahgwa Mt. (-DD), *Rennie 532* (NU); Bulwer-Impendhle rd, *Hilliard & Burt 7605* (NU); Everton, banks of Molweni Riv., *Hilliard & Burt 5624* (NU).

—2930 (Pietermaritzburg): Shafton, Howick (-AC), *Hutton 219* (GRA, PRE); Nottingham rd, distr. Drayton, *Smith 215* (NU); Lidgetton, *M.-Wood 8337* (NH); Tweedie, *Tyson 2109* (BOL), *M.-Wood 11053* (SAM); Greytown distr. (-BA), *Wylie NH 22419* (NH, PRE, K); Hilton rd (-CB), *Sidey 2059* (MO, S); Arnolds Hill, Richmond (-CD), *Wylie NH 23336* (NH).

—3029 (Kokstad): In rip. fl. Umzimhlava (-AD/-CB), *Schlechter 6547* (PRE, B, Z); Hela-Hela rd from Lufafa rd (-BA), *Shirley, 21/1/1978* (NU); Malowe Mts (-BD), *Tyson 2109* (SAM); Ad ripas fl. Umzimkulu pr. Clydesdale (-BD), *Tyson 2109* (BOL, GRA, K); Ca Kokstad (-CB), *Tyson 1372* (GRA, PRE, SAM, K), *Taylor 5572* (NBG); Harding (-DB), *Oliver NH 19132* (NH).

—3030 (Port Shepstone): Friedenau, Dumisa (-AD), *Rudatis 270* (S); Fairfield, Dumisa, *Rudatis 564* (STE, K); Rd to Umzinto (-BC), *Germish 1824* (PRE).

TRANSKEI—3128 (Umtata): Umtata (-DB), fld at Kirstenbosch, *Abernethy NBG 382/32* (BOL); Umtata Riv. (-BC/-DD), *Abernethy NBG 1035/36* (NBG).

Without precise locality: ex hort. *Leichtlin* (K).

According to Baker (1877) who described the species, it was introduced into Scotland by Mr G. H. Potts of Lasswade near Edinburgh who got it from the Cape, the precise locality not known. As it flowered there in August, it probably was grown from seeds—seedlings are able to adapt more readily to the seasons of the northern hemisphere. Mr McNabb of the Edinburgh Botanical Garden distributed it freely under the name *Gladiolus pottsii*. Baker's description was, however, not made from the Edinburgh plants, but from a specimen sent to Kew by Max Leichtlin who grew it in his garden at Baden-Baden. The source of these plants is also not known. The Leichtlin specimen preserved in the Kew herbarium constitutes the holotype. This has leaves 12–18 mm wide and not plicate. The plant illustrated as *Montbretia pottsii* in *The Garden* p. 84 (1880) and that in *Curtis's bot. Mag.* t. 6722 (1883) have apparently wider, plicate leaves, more like that of *C. mathewsiana*. The inflorescence, however, is that of *C. pottsii*.

C. pottsii is distinguished by its firm erect, plane, linear-lanceolate leaves with a prominent middle vein and several lateral veins, a panicle with ascending branches, a slightly curved perianth tube which is narrow near the base, then dilating fairly suddenly at or below its middle, and is about twice the length of the perianth segments; these are slightly spreading, except for the posticous one that is somewhat larger and correct, thus protecting the stigmas.

5. *Crocasmia mathewsiana* (l.Bol.) Goldbl. ex De Vos, comb. nov.

Tritonia mathewsiana L.Bol. in Ann. Bol. Herb. 3: 76 (1923); Flow. Pl. S. Afr. 3: 94 (1923). Type: Transvaal, Graskop, Pilgrim's Rest, Wood s.n. NBG 542/16, filed at Kirstenbosch (BOL, holo.-).

Icones: Flow. Pl. S. Afr. 3 t. 94; this work Fig. 6.

Plants 1 000–1 500 mm or sometimes higher. *Corms* single or in superposed groups of 2–3, or connected by long slender stolons, depressed globose, 20–30 mm in diam., tunics brown, membranous, later fibrous. *Scape* 1 000–1 500 mm, largely covered with long leaf sheaths, cylindrical. *Basal leaves* 4–5, plicate, elliptic-ensiform, 750–900 × (20–)25–35 mm, tapering to an acute or acuminate tip and an almost stalk-like base, with numerous prominent veins; cauline leaves smaller, the uppermost reduced to ca. 60 mm in length. *Inflorescence* a large, lax panicle 200–300(–600) mm long, with 4–6 slender distichous, ascending and at length, spreading, curved or flexuose, primary and often also secondary branches (50–)100–150(–250) mm long, each with numerous flowers that are fairly densely arranged and usually almost secund on the upper side of the branches. *Bracts* largely membranous, the younger subherbaceous, reddish- or orange-brown, oblong, 3–6 mm long, shorter than the internodes; outer acute or apiculate,

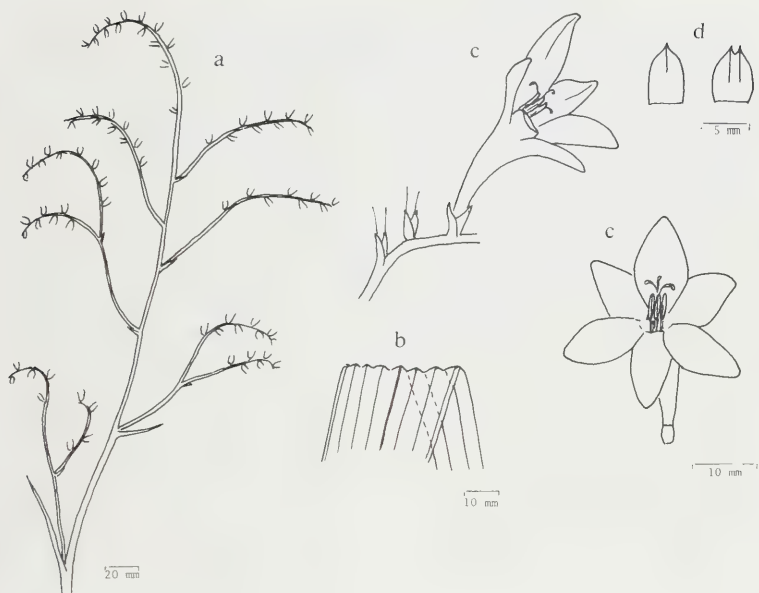


FIG. 6

Crocoscopia mathewsiana. a, panicle, diagrammatic; b, part of foliage leaf bent over, showing primary veins; c, flower; d, outer (left) and inner (right) bract. (from a drawing by M. M. Page in BOL)

keeled in the upper half; inner minutely bidentate, 2-veined. *Flowers* slightly zygomorphic, funnel-shaped, 28–38 mm long, reddish-orange, sometimes pinkish. *Perianth tube* funnel-shaped, slightly curved, 18–22 mm long, tubular in the lower quarter, widening gradually to ca. 7 mm diam. at the mouth; *segments* slightly unequal, ovate-elliptic, obtuse, at length spreading, 12–17 × 5–7 mm, the median posticous segment largest, 15–17 mm long. *Filaments* 13–15 mm; *anthers* contiguous, 5–7 mm, somewhat exserted, orange, reaching about halfway up the segments. *Style* 20–23 mm; branches 5 mm; *stigmas* slightly widened, minutely fimbriate, reaching the anther tips. *Cap-sules* subglobose-obscurely 3-angled, 8 mm long; *seeds* few, angled, 4 mm diam.

Flowering period: January to February.

Distribution: E Transvaal, in a small area on the Drakensberg escarpment, in damp shady places and on the margins of plantations. Fig. 2.

TRANSVAAL—2430 (Pilgrim's Rest): Mariepskop, Klaserie Riv. nr Waterfall (-DB), *Van der Schyff* 5973 (PRE); Graskop, fired at Kirstenbosch (-DD), *Wood* NBG 542/6 (BOL); Edge of the Berg, Graskop, *Galpin* 14383 (PRE), *Galpin s.n.* (BOL); Top of Kowyns Pass, *Leighton* 3257 (BOL, PRE); 5 mls from MacMac Falls towards Graskop, *Nel* 293 (NBG, PRE).

—2530 (Lydenburg): Lydenburg distr., *Burt Davy* 1477 (PRE); Betw. Sabie & Graskop (-BB), *Cassidy* PRE 36645 (PRE).

Without precise locality: Natal, *De Mole & Kirch* BOL 32340 (BOL).

This species is closely related to *C. paniculata* and can hardly be distinguished from the latter in the vegetative stage. It differs in its panicle which has slender, ascending, then curved or flexuose, not or only faintly zigzag branches with internodes longer than the bracts; and in its usually almost secund flowers with the perianth tube slightly longer than the segments and the posticous segment slightly larger than the other five almost equal segments.

Two collections in PRE, namely *Nel* 293 and *Cassidy s.n.*, vary in their pinkish flowers which are more slender than usual.

Goldblatt (1971: p. 422) used the name *C. mathewsiana* without officially transferring the species to *Crocasmia*.

6. ***Crocasmia paniculata*** (Klatt) Goldbl. in JI S. Afr. Bot. **37**: 444 (1971); Compton, JI S. Afr. Bot. Suppl. Vol. **11**: 140 (1976).

Antholyza paniculata Klatt in Linnaea **35**: 379 (1865) & in Abh. Naturf. Ges. Halle **15**: 345 (1882); Bak. in J. Linn. Soc. **16**: 180 (1877) & Handb. Irid. 229 (1892) & in Fl. Cap. **6**: 168 (1896). Type: Natal, without precise locality, *Gerrard* 1530 (K, holo.-; BOL).

Curtonus paniculatus (Klatt) N. E. Br. in Trans. Roy. Soc. S. Afr. **20**: 270 (1932); L. Bol. in S. Afr. Gard. **23**: 46 (1933); G. J. Lewis in Ann. S. Afr. Mus. **40**: 98, 102 (1954).

Icones: Pearse, Mountain Splendour p. 89 figs 2–5; this work Fig. 7.

Plants 1 000–1 300(–1 800) mm high. *Corms* single or in superposed groups of 2–3, depressed globose, 25–40(–50) mm diam.; tunics brown, membranous, later fibrous towards the top. *Scape* 1 000–1 500(–1 800) mm, strong, cylindrical, often reddish-brown. *Basal leaves* several, plicate, elliptic-ensiform, 400–600(–900) × (15–)25–50(–80) mm, oblique towards the base, tapering to an acute or acuminate tip and an almost stalk-like base, with numerous prominent veins, often with minute hair stumps on the veins; *cauline leaves* 150–200 mm, the lower ones sometimes plicate. *Inflorescence* a large panicle 100–200(–350) mm long, on a rigid scape up to 9 mm in diam., with 2–5 distichous, almost horizontal primary and sometimes secondary branches, each with a straight and then zigzag axis up to 150 mm

long and numerous densely arranged flowers which are at first distichous and later become somewhat secund on the upper side of the branches. *Bracts* submembranous, reddish-brown, obovate, 7–10 mm long, exceeding the internodes in length; *outer* obtuse or apiculate, slightly crisped at the top; *inner* shortly bidentate with acute teeth, 2-veined. *Flowers* strongly zygomorphic, narrowly funnel-shaped, (40–)50–75 mm long, orange-red, rusty red or brownish-orange, “*intus rubro-punctata*”? (cf. Klatt). *Perianth tube* curved,

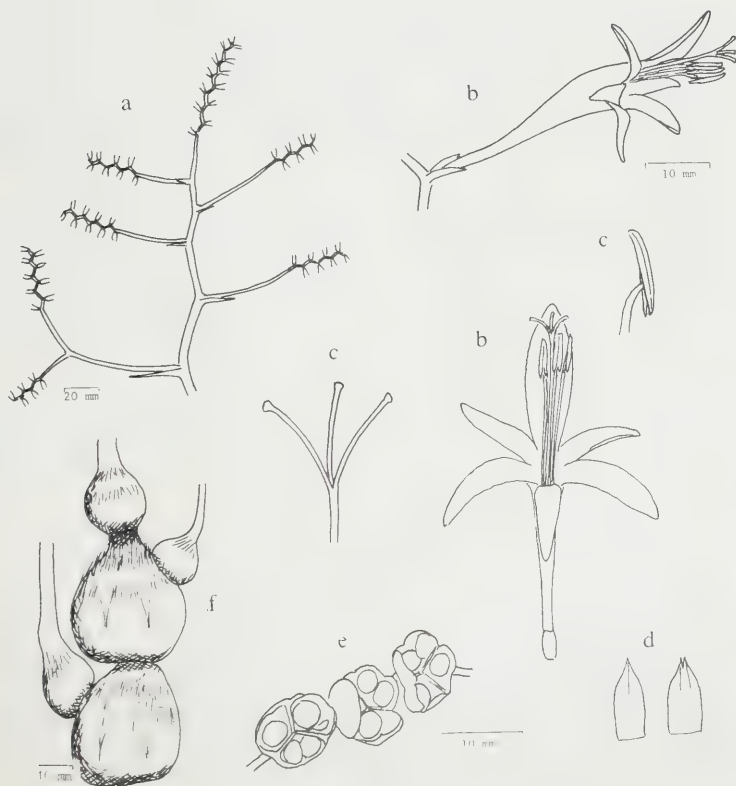


FIG. 7

Crocoscemia paniculata. a, panicle, diagrammatic; b, flower; c, anther, style branches and stigmas; d, outer (left) and inner (right) bract; e, capsules; f, corms, with tunics. (de Vos 2581)

tubular in the lower half, gradually widening to funnel-shaped, (25–)30–40(–45) mm long, more than twice the length of the segments, 5–7 mm in diam. at the oblique mouth; *segments* very unequal, obtuse; posticous segment erect, elliptic to lanceolate, (10–)15–18 × 6–9 mm, exceeding the other segments by 5–10 mm; upper laterals 7–10 × 5 mm, elongated-triangular, spreading, the three anticus segments elliptic, 6–12 × 3–5 mm, the median one smallest. *Filaments* 25–40 mm, curved towards the upper segment; *anthers* 6–8 mm, contiguous, placed towards the upper segment, reaching its tip; pollen pale. *Style* (35–)50–65 mm, branches 4–6 mm long; *stigmas* slightly widened or sometimes shortly bifid, reaching or overtopping the anthers. *Capsules* globose-3-lobed; *seeds* globose or angled, 4 mm diam. *Chromosome number* $2n = 22$ (Goldblatt, 1971).

Flowering period: December to February.

Distribution: Drakensberg of E Transvaal, NE Orange Free State, Natal, Lesotho, Swaziland and E Zimbabwe, in moist places and forest margins. Fig. 2.

TRANSVAAL—2430 (Pilgrim's Rest): Ohrigstad (-DC), *Jacobsen* 2250 (PRE); MacMac Forest Plantation (-DD), *Kopp* 1119 (PRE), *Mudd* BOL 32336 (BOL); Lisbon Waterfall, *Van Wyk* 816 (PRE); Graskop nr The Pinnacle, *Louw* 3207 (STE); Above MacMac Falls, *Goldblatt* 417 (BOL); Near MacMac picnic area, *De Vos* 2581 (STE).

—2529 (Witbank): Ca. 2 km E of Middelburg (-CD), *Onderstall* 208 (PRE); Wilgeboom Forest Sta. (-DD), *Leighton* 3251 (BOL).

—2530 (Lydenburg): Paardeplaats, Lydenburg, *Wilms* 1448 (S); Zwagershoek nr Lydenburg (-AB), *Obermeyer* 364 (PRE); Dullstroom (-AC), *Werdermann & Oberdieck* 2031 (PRE, K); De Kuilen (-BA), *Anderson* A148 (PRE); Rosehaugh (-BD), *Sim* NBG 3963/14 (NBG); 5 mls S of Machadodorp (-CB), *Bruce* 470 (PRE); Kaapse Hoop (-DB), *Van Jaarsveld* 1072 (PRE); Moodies (-DD), *Thornicroft* s.n. (K, MO); Nelsberg, *Knox-Davies* s.n. BOL 32335 (BOL).

—2531 (Komatipoort): Umlomati Valley, Barberton (-CC), *Galpin* 1211 (BOL, GRA, PRE, SAM); Lomati (-CD), *Williamson* 265 (PRE).

—2630 (Carolina): 24 mls E of Ermelo (-AD), *Codd* 6380 (PRE); Nr Athole Pasture Stn (-CB), *Codd* 384 (PRE).

—2730 (Vryheid): Oshoek (-AD), *Devenish* 563 (PRE, RSGH).

SWAZILAND—2631 (Mbabane): Hawane Falls (-AA), *Compton* 27402 (NBG); Mbabane (-AC), *Rogers* 11850 (K); Dralriach, *Bolus* 12357 (BOL); Nr Forbe's Reef (-BD), *Compton* 26519 (NBG); Usutu Forest (-CA), *Keet* NBG 64782 (NBG).

ORANGE FREE STATE—2828 (Bethlehem): Bestersvlei nr Witzieshoek (-DB), *Flanagan* 6500 (PRE), *Jacobsz*, *Bolus* 8301 (BOL, GRA).

—2829 (Harrismith): Zaaiohoek, distr. Harrismith, *Thode* 8522 (STE); 8 mls SSW of Harrismith (-AC), *Acocks* 23829 (PRE); Foothills of Platberg, *Van der Zeyde* NBG 95739 (NBG).

LESOTHO—2828 (Bethlehem): Leribe (-CC), *Dieterlen* 458 (PRE, SAM, K).

ZIMBABWE—(Melsetter): Umtali, Cloudlands, Vumba, *Chase* 6315 (SRGH).

Without precise locality: *Mudd* s.n. (K); Natal, *Wood* 3499 (K); Natal & Zululand, *Gerrard* 1530 (BOL, K).

This high altitude species from the eastern parts of southern Africa is

known as Waaierlelie (Eliovson, 1973). The plants are large and have large pleated leaves and a strong scape terminating in a large panicle with distichous branches. Each branch diverges from the main branch at an almost right angle and consists of a straight, rigid, single-internoded lower part 40–100 mm long and a strongly zigzag upper part with numerous short internodes and numerous closely arrayed, long-tubed flowers. These somewhat resemble those of certain species of *Chasmanthe* and *Anapalina*. In the Transvaal the shoot dies down in winter.

C. paniculata is closely related to *C. mathewsiana* and *C. pearsei*, and in the vegetative stage these species can hardly be distinguished. It differs from the former in its more strongly zygomorphic, longer-tubed flowers with more unequal perianth segments which arise obliquely from the tube; the posticous segment is largest and arises three to five millimetres beyond the anticus lobe. The inflorescence differs in its widely spreading, strongly zigzag branches, with internodes shorter than the bracts. See further under *C. pearsei* and *C. fucata*.

The monotypic genus *Curtonus* is one of the eight genera established by N. E. Brown (1932) for the heterogeneous collection of species that were placed in *Antholyza*. *Curtonus* was upheld by Phillips (1941, 1951), but L. Bolus (1933) thought that "the genus rests on too weak a basis to be stable" and that it should be combined with *Chasmanthe*. Lewis (1954) on the other hand, suggested that *Curtonus*, although closely related to *Chasmanthe* and *Crocasmia*, should be kept separate. As a result of his chromosome studies of South African Iridaceae, Goldblatt (1971) came to the conclusion that *Curtonus paniculatus* must be included in the genus *Crocasmia*, on grounds of similarities in their karyotypes as well as their morphology. This view is upheld here.

7. ***Crocasmia pearsei*** Oberm. in *Bothalia* 13: 450 (1981). Type: Natal, summit of Mnweni Pass in Drakensberg, *Pearse* 34 (PRE, holo.-).

Icones: *Bothalia* ibid. Fig. 21, 22; *Pearse*, Mountain Splendour p. 87, fig. 3.

Plants 800–1 000 mm high. *Corm* tunicated, with fibrous tunics. *Shoots* deciduous. *Scape* up to 1 000 mm long, erect, green, covered with leaf bases for most of its length. *Basal leaves* several, plicate, narrowly elliptical, tapering to an acute tip and an almost stalk-like base, ca. 500 × 35–70 mm; cauline leaves smaller. *Inflorescence* a simple erect spike, sometimes with a short basal side branch, with numerous densely arrayed distichous, or sometimes secund, ascending-spreading flowers on a straight or faintly zigzag axis. *Bracts* membranous, reddish-brown, ovate, erect, 8–10 mm long; *outer* apiculate; *inner* minutely bidentate. *Flowers* strongly zygomorphic, largely

tubular or narrowly funnel-shaped, 70–90 mm long, orange. *Perianth tube* curved, tubular in the lower third, gradually widening to ca. 10 mm at the oblique mouth, 40–55 mm long, about twice the length of the segments; *segments* very unequal, elliptic, obtuse, somewhat obliquely attached, with the posticous segment longest, erect $20-30 \times 10-12$ mm, other segments $14-16(-20) \times 7-8$ mm, slightly spreading. *Filaments* ca. 45–50 mm; *anthers* slightly exserted, 6–7 mm long. *Ovary* 7–9 mm long; *style* 50–60 mm, branches exserted, orange; *stigmas* slightly widened or shortly bifid. *Cap-sules* (immature) 8×6 mm.

Flowering period: January.

Distribution: on summits of two Drakensberg passes, near Cathedral Peak and Mont-aux-Sources (2 200–3 000 m). Fig. 2.

NATAL—2828 (Bethlehem): Icidi Pass, Drakensberg (-DD), *Gray s.n.* PRE 58368 (PRE).

—2829 (Harrismith): Summit of Mnweni Pass, Drakensberg (-CC), *Pearse 34* (PRE).

This high altitude species has been collected only three times, at altitudes of 2 200–3 000 m. It is very closely related to *C. paniculata* which usually also occurs at high altitudes. It might perhaps be regarded as a variety of the latter species. It differs from the latter in its somewhat larger flowers with larger ovary and wider perianth segments, and in its green scape terminating in a simple or one-branched spike with a more or less straight or only faintly zigzag axis. It also differs in habit: the plants are solitary and the leaves deciduous, whereas *C. paniculata* forms large clumps and has evergreen leaves, according to Obermeyer. (S. Eliovson, however, mentions (1973) that these plants die down in April, and I also found only withered specimens of this species in July 1982 in the eastern Transvaal.)

8. *Crocoshmia fucata* (Herb.) De Vos, comb. nov.

Tritonia fucata Herb. Bot. Reg. **24** t. 35 (1838): Loudon, Ladies Fl. Gard. Ornam. Bulb. Pl. 75 & Pl. 16/1 (1841); Klatt in Linnaea **32**: 758 (1863), pro parte, excl. cit. Iconotype: Bot. Reg. **24** t. 35 (lectotype here designated).

Antholyza fucata (Herb.) Bak. in J. Linn. Soc. **16**: 180 (1877) & Handb. Irid. 229 (1892) & in Fl. Cap. **6**: 167 (1896); Klatt in Ber. Naturf. Ges. Halle **15**: 345 (1882).

Chasmanthe fucata (Herb.) N. E. Br. in Trans. Roy. Soc. S. Afr. **20**: 274 (1932); L. Bol. in S. Afr. Gard. **23**: 46 (1933); G. J. Lewis in Ann. S. Afr. Mus. **40**: 98 (1954).

Petamenes fucata (Herb.) Phill. in Bothalia **4**: 44 (1941).

Icones: Bot. Reg. **24** t. 35; Loudon, Ladies Fl. Gard. Ornam. Bulb. Pl. pl 16/1; this work Fig. 8.

Plants 1 300–1 700 mm high. *Corms* depressed globose, 30–50 mm diam., often superposed in vertical or horizontal rows of 2 or more; tunics thin, papery, soon disintegrating. *Scape* 1 300–1 700 mm, erect rigid, cylindrical, reddish-brown on the side facing the sun. *Basal leaves* several, plane, linear-ensiform, acuminate, (700–)1 000–1 200 × 15–30 mm, with a prominent middle vein and several primary veins; *cauline leaves* few, to 200 mm long. *Inflorescence* a long, erect or curved spike up to 220 mm long, often with 1–2 ascending branches which have a 70–120 mm long straight lower part and a slightly zigzag upper part with numerous densely arranged flowers

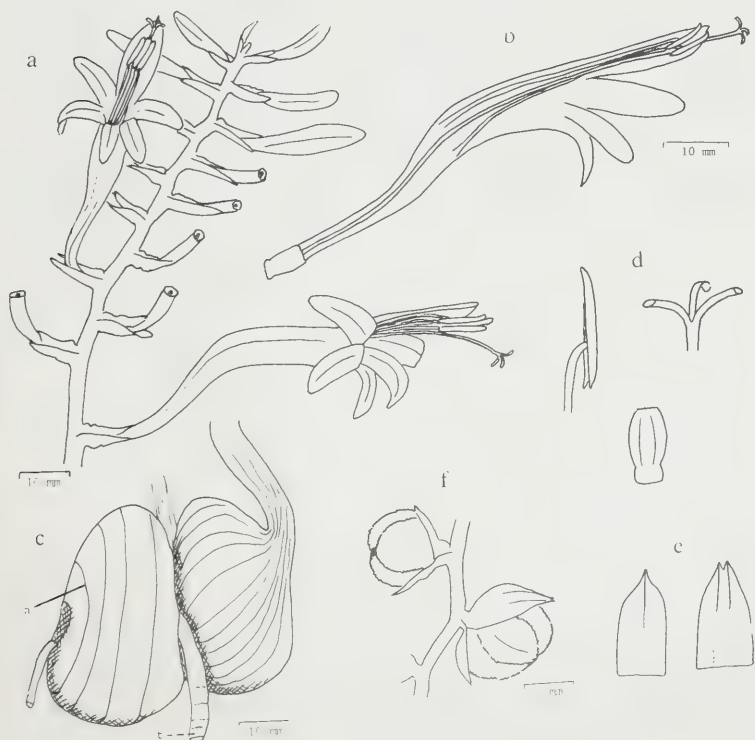


FIG. 8

Crocoscopia fucata. a, spike; b, flower, median section; c, corms, old without tunics (left) and new corm (right) with tunics; d, anther, style branches, and stigmas and ovary; e, outer (left) and inner (right) bract; f, capsules. (de Vos 2579)

which are distichous in bud and in fruiting stage and sometimes secund in flowering stage. *Bracts* subherbaceous, dark red on side facing the sun and green on opposite side, 8–12 mm long; *outer* elliptic, subobtuse or irregularly lacerated, with obscure veining; *inner* elliptic-triangular, minutely bidentate, obscurely 2-veined, slightly longer than the outer, with a lateral bulge near the base. *Flowers* strongly zygomorphic, curved, narrowly funnel-shaped, 65–80 mm long, cherry-red on posticous side (RHS 45A-C, 46B), saffron-yellow or greenish-yellow on anticus side (RHS 21C or 4A). *Perianth tube* curved, tubular in the lower third, gradually widening to cylindrical (ca. 7 mm diam.) in the upper half, with a slight posterior bulge where it widens and an oblique mouth; segments unequal, elliptic to elliptic-triangular, subobtuse, the posticous segment largest, arising ca. 4 mm beyond the anticus, porrect, (12–)15–18 × 6–8 mm; other segments spreading or slightly recurved, the three anticus segments smallest, 10–12 × 4–5 mm, yellow with median stripes. *Filaments* ca. 35 mm; *anthers* 7–8 mm long, contiguous, purplish-red, placed against the posticous segment and reaching its tip or higher; pollen pale yellow. *Ovary* ellipsoid, 5–7 mm long, broad based; *style* 60–75 mm, red, branches 3–4 mm; *stigmas* slightly widened, overtopping the anthers and posticous segment. *Capsules* globose-trilobed, with a rough surface; *seeds* angled, wrinkled, 5 mm in diam. *Chromosome number* $2n = 22$ (see p. 469)

Flowering period: November to December.

Distribution: found only on a few farms on the Kamiesberg of Namaqualand, in wet kloofs. Fig. 1.

CAPE—3017 (Hondeklipbaai): “Nieuw Kerksfontyn” (=Niekersfontein? -BB), *Pappe s.n.* (SAM); Upper S W slopes of Sneeuokop (-AA), *Pearson 5760* (BOL). —3018 (Kamiesberg): Farm Modderfontein, Jongenskloof, *de Vos 2579* (STE).

This probably rare species has been collected a few times only on the Kamiesberg in wet kloofs. It is, however, well-known to those farmers on whose farms it occurs. The earliest collection was brought from an unknown locality in the Cape to William Herbert's garden in England where the corms grew and multiplied for about 25 years without flowering. After applying a dressing of manure in 1836, the plants flowered the following year, whereupon Herbert described and figured the species in 1838 as *Tritonia fucata*. The locality of the species remained unknown until the nineteenth century when specimens were gathered in the Kamiesberg, by either Pappe or Zeyher, and again in 1910 by Pearson. (Pappe, who had acquired Zeyher's herbarium, was in the habit of rewriting Zeyher's labels). The third collection of the species was made by the present author in 1983. On account of it

flowering from November to December, which for Namaqualand is a late flowering period and the fact that plants not in flower resemble *Watsonia*, it is probable that the species has been overlooked by most collectors.

Several investigators recognised the close relationship between this species and *C. paniculata*, notwithstanding the fact that the distance separating their distributions is about 1 000 km. Baker (1892, 1896) placed *C. fucata* next to *C. paniculata* (both as *Antholyza*) in his treatment of the Iridaceae. L. Bolus (1933) regarded both as species of *Chasmanthe*, but Lewis (1954) proposed that *C. fucata* should be transferred to *Curtonus*, a monotypic genus which was established by Brown (1932) to harbour *C. paniculata* and which, "although closely related to *Chasmanthe*, seems to be sufficiently distinct to merit generic status" (Lewis, 1954: p. 98). In 1971 Goldblatt, however, transferred *C. paniculata* to *Crocoshmia* where it undoubtedly belongs. As he had no fresh material of *C. fucata*, he did not examine its chromosomes. These could now be counted.

C. fucata is undoubtedly closely related to *C. paniculata*. They have similar persistent, many noded corms in superposed rows, strongly zygomorphic flowers with long, gradually widening perianth tube and porrect posticous perianth segment, anthers bifid from their bases for about one-third of their length, almost similar laxly branched inflorescences with long branches which are bare and straight in their lower half and which bear flowers only in their upper half, subglobose capsules with few seeds in which the outer layers of the testa are loose, and chromosome number of $2n = 22$. The only significant differences are the leaves which are plane in *C. fucata* and plicate in *C. paniculata*, and the capsules which have a rough surface in *C. fucata*.

Both these species differ from *Chasmanthe* in which *C. fucata* had been included, in their persistent corms, gradually widening perianth tubes, anthers that are equally high and bifid for only one-third of their length (in *Chasmanthe* the anthers are bifid for almost half their length and one anther stands higher than the other two), shorter capsules with seeds which have loose outer layers, and in their chromosome number of 22 instead of 20 in *Chasmanthe*.

A *CROCOSHMIA* HYBRID

9. *Crocoshmia* × *Crocoshmiiflora* (Lemoine ex Morren) N. E. Br. in Trans. Roy. Soc. S. Afr. **20**: 264 (1932), (*C. pottsii* × *aurea*).

Montbretia × *crocoshmiaeflora* Lemoine ex Morren in Belg. Hort. **31**: 299 & t. 14 (1881); André in Rev. Hort. Paris 124 (1882); Fitch (del.) in Flor. Mag. n.s.pl. 472 (1881?) as *crocoshmaeflora*; Bak. in Fl. Cap. **6**: 129 (1896) as *crocoshmaeflora*. Iconotype: Belg. Hort. 31 t. 14 (lectotype here designated).

Tritonia $\times$ *crocosmiflora* Nicholson, Dict. Gard. 4: 98 (1888). Type: Flor. Mag. t. 472 (lectotype here designated).

Icones: Belg. Hort. 31 t. 14; Flor. Mag. t. 472; Eliovson opp. p. 131 (1973); this work Fig. 9.

Plants 250–500(–1 000) mm high. *Corms* often in superposed groups of 2–3 or connected by long slender stolons, depressed globose to ovoid 15–25 mm in diam.; tunics membranous, brown. *Scape* 250–500(–1 000) mm, usually 2–3-ribbed, strong. *Basal leaves* several, plane, linear-lanceolate or ensiform, acute, 300–500 $\times$ 8–15(–20) mm, with a prominent middle vein and several more veins; cauline leaves smaller than the basal. *Inflorescence* a lax panicle 200–450 mm long, with several ascending-spreading, later slightly zigzag branches, each with 4–8 or more distichous flowers. *Bracts* sub-membranous, reddish with brownish tips, 6–10 mm long; *outer* acute; *inner* bidentate, 2-veined, 2-keeled in the upper part. *Flowers* slightly zygomorphic, funnel-shaped, 30–40 mm long, orange or reddish-orange (RHS 28A–33A), slightly paler towards the throat, sometimes with a reddish mark on the anticus or on all perianth segments in the throat. *Perianth tube* fun-

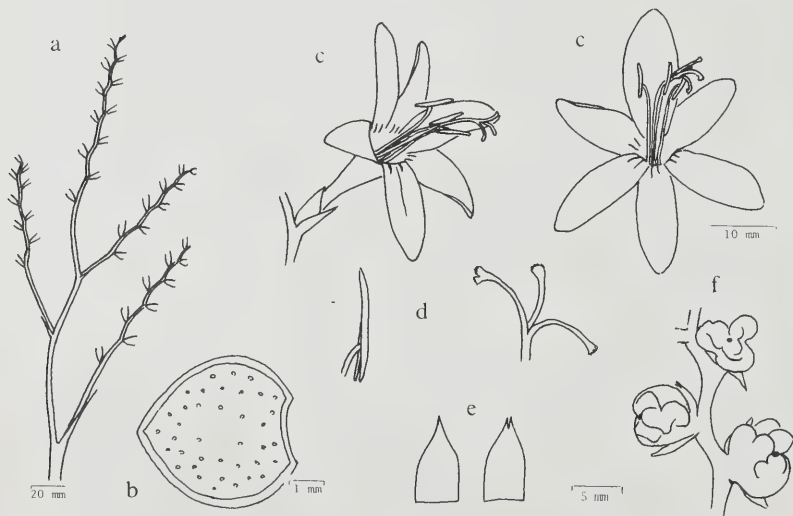


FIG. 9

Crocossia $\times$ *crocossmiflora*: a, panicle, diagrammatic; b, peduncle in transverse section; c, flower; d, anther, style branches and stigmas; e, outer (left) and inner (right) bract; f, capsules abortive. (de Vos 2574).

nel-shaped, slightly curved, 10–15 mm long, widened to 4–6 mm at the mouth, subequal to the segments; *segments* subequal, slightly spreading, lanceolate to oblong, obtuse, 15–20(–25) $\times$ 6–9 mm, the outer often with recurved tips. *Filaments* 15–22 mm; *anthers* widely exserted, 6–8 mm long, orange-yellow, reaching the upper half of the perianth segments. *Style* 30–35 mm; branches ca. 4 mm long, widely exserted, overtopping the anthers and often also the perianth tips; *stigmas* slightly widened or shortly bifid at the tips, minutely fimbriate. *Capsules* few, nodose and deeply 3-lobed, up to 7 $\times$ 9 mm, usually without viable seeds. *Chromosome number* $2n = 22$ (Goldblatt, 1971).

Flowering period: January (Cape) to April (Transvaal).

Distribution: a garden hybrid known as Garden Montbretia or Autumn Gold. Garden escapes occur world-wide.

This hybrid was developed by the French horticulturalist Victor Lemoine at Nancy in the nineteenth century, when he fertilised *C. pottsii* with pollen of *C. aurea*. His plants flowered for the first time in August 1880, after which he released them in the trade under the name *Montbretia crocosmiaeflora*.^{*} It has become a fairly popular garden plant and specimens are preserved in several herbaria. Garden escapes have been found in numerous countries. In South Africa it occurs for example near George (*Viviers 131* in STE), in the Tsitsikamma National Park (*Liebenberg 7957* in PRE), and at Port St. Johns (*Galpin* NBG 258/29 in BOL). It has also been found in Uganda (*Nothill 2742* in K, *Kaunda 1* in MO), Kenya (*Clarke e.a. 40J* in K), Mauritius (*Lorence 2278* in MO), Madagascar (*Croat 29890* in MO), New Guinea (*Millar 12151* in L), Bolivia (*Badcock 873* in B), as well as in Sumatra, Hawaii and Malaya.

C. crocosmiaeflora has characters intermediate between its two parent species. It is distinguished by slightly zygomorphic, funnel-shaped flowers with a perianth tube subequal to or slightly shorter than the segments and with exserted anthers and style branches. The flowers open wider than in *C. pottsii* but the perianth lobes are not widely reflexed as in *C. aurea*. The leaf texture is intermediate: not as soft textured and silky as in *C. aurea* and not as rigid as in *C. pottsii*; the prominence of the veins is also intermediate between the two parent species. There is a considerable range of colour within the limits of orange and yellow, and reddish marks sometimes occur in the throat of the perianth. The peduncle is usually two-edged—another character intermediate between the ribbed peduncle of *C. aurea* and the smooth one of *C. pottsii*.

^{*} Since then many seedling forms have been raised, especially in England (cf. *Dict. of Gardening*).

The figure in *Flowering Plants of S. Africa* 4 Pl. 152 (1924) sub *C. crocosmaeflora* is that of a plant from the botanical garden of the Division of Botany, Pretoria, which is preserved in that herbarium as PRE 2848. This figure, as well as the herbarium specimens, shows several features that stand closer to *C. aurea* than to the hybrid, such as a ribbed peduncle, widely spreading perianth segments and widely exerted stamens and style. The only typical hybrid character is the stronger textured leaves which are evident in the preserved specimens. Indeed, a note by R. A. Dyer on one of the two herbarium sheets states that the F.P.S.A. supposition has no proof, and that this plant may still be *C. aurea*. Perhaps these plants were a back cross between the hybrid *C. crocosmiiflora* and *C. aurea*. This can explain the predominance of *C. aurea* characters.

SPECIES INCOMPLETELY KNOWN

***Crocoshmia cinnabarina* (Pax) De Vos** in Jl S. Afr. Bot. **49**: 415 (1983).

Tritonia cinnabarina Pax in Bot. Jb. **15**: 152 (1893); Bak. in Fl. Trop. Afr. **7**: 357 (1898). Type: Angola, Catala Ganginga, Teusch, in Exped. A. von Mechow 573 (B, holo.-).

Plants up to a metre high. *Corms* globose, ca. 15–45 mm in diam.; tunics papery, brown. *Scape* up to a metre, slightly 2-edged. *Basal leaves* said to be absent; cauline several, plane, ensiform, somewhat sickle-shaped, overtopping the scape, 400–600 × up to 25 mm, with a prominent middle vein and several other smaller veins, thin-textured. *Inflorescence* a lax spike with two short ascending, 3–4-flowered, zigzag branches. *Bracts* hyaline-membranous or scarious, triangular, acute, 3–5 mm long. *Flower* in a not fully developed stage 15 mm long, funnel-shaped, vermilion. *Perianth tube* 5 mm long; *segments* in a young condition slightly unequal, oblong or lanceolate, twice the length of the tube. *Style* slender, equal to the stamens, with somewhat cuculate branches. *Capsule* obtusely angled-globose, ca. 10 mm in diam.; *seeds* angled, brown, 4 mm in diam.

Flowering period: January.

Distribution: Angola.

This species is known only from its type specimen brought back from Angola by the A. van Mechow expedition of 1881. Pax probably never saw an open flower and his description is that of a flower in a “nicht völlig entwickelten” stage, with included stamens and style, and acute perianth segments. The type specimen in the Berlin–Dahlem herbarium has indications of six flowers on the main axis and three to four on the branches of the inflorescence. Now only one flower bud and an immature capsule are preserved.

It is undoubtedly a *Crocoshmia* related to (if not identical with) *C. aurea* var. *pauciflora* which also occurs in Angola. There is no knowing whether the stamens and style would not become exerted in fully open flowers. If this is the case, there is no reason why the species cannot be conspecific with *C. aurea* var. *pauciflora*.

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